TIGHT BINDING BOOK

UNIVERSAL
LIBRARY

OU_162594

UNIVERSAL
LIBRARY

OSMANIA UNIVERSITY LIBRARY

Call No. 598, B53M Accession No. 19436

Author Berridge, W.S.

Title Marvels of Reptile Life.

This book should be returned on or before the date last marked below.

MARVELS OF REPTILE LIFE

BY

W. S. BERRIDGE, F.Z.S.

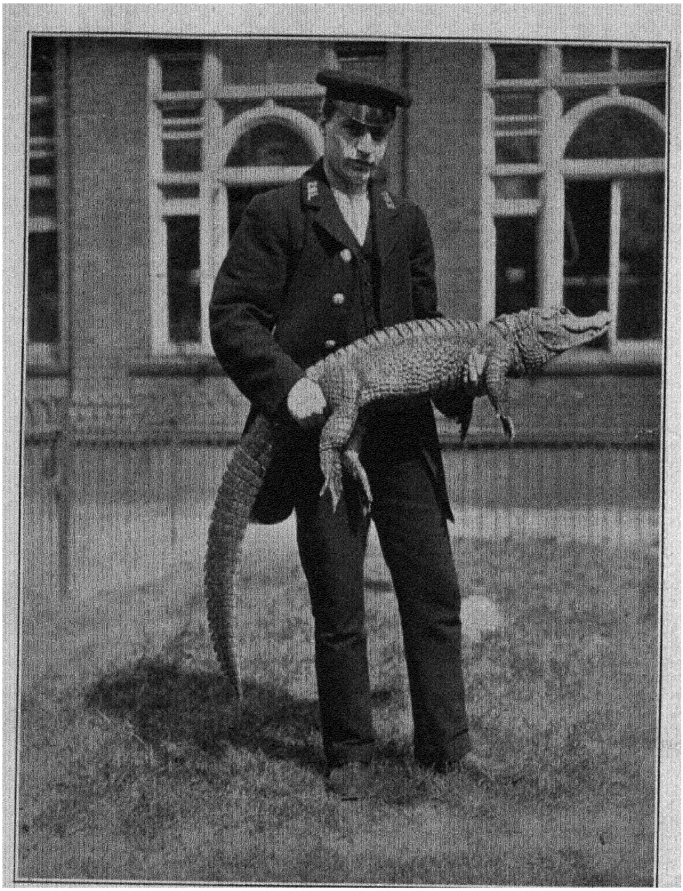
AUTHOR OF "WONDERS OF ANIMAL LIFE," "MARVELS OF THE ANIMAL WORLD," "MARVELS OF NATURAL HISTORY" ETC.

With numerous Photographic Illustrations from life by the Author

THORNTON BUTTERWORTH, LTD.
15 BEDFORD STREET, LONDON

Made and printed in Great Britain
All rights reserved.

ANIA UNIVERSITY LIBRARY



A TAME CHINESE ALLIGATOR

(See pages 162, 164)

PREFACE

Although the term " Reptile " should, strictly speaking, only be applied to the snakes, lizards, tortoises, crocodiles, and alligators, in the more general and popular sense it is employed to embrace further the frogs, toads, salamanders, newts, etc., which constitute the class known as Amphibians or Batrachians.

Such being the case, and in view of the fact that the present book does not purport to be a scientific treatise, the writer feels he may take the liberty of including the latter group of creatures under the heading of " Reptiles " without receiving at the outset the censure of the critical reader.

All reptiles are cold-blooded creatures. Their bodily temperature is governed by that of their surroundings, and they have not the power that warm-blooded animals possess of retaining internal heat irrespective of external conditions.

If the air around them be cold, the reptiles are also cold ; and it is not the least good their running about to keep their toes warm (should they happen to have any), for no amount of exercise will have that effect. For this reason they are only found in tropical and temperate zones, and are absent in the Arctic and Antarctic regions.

A great diversity of form and structure exists among the members of the reptilian order. Some of them possess well-developed limbs, while in others they are lacking. Those of the Tortoise assume a club-like formation, and in the Turtles they are modified into paddle-like organs that serve for progression through the water.

The amphibians differ from the typical reptiles in the fact that, with few exceptions, they undergo a series of changes during their growth, and breathe by means of gills through the early stages of their existence ; whereas the latter are solely lung-breathers, and do not pass through any metamorphosis after birth.

W. S. B.

CONTENTS

CHAPTER PAGE

I. A Talk about Snakes - - - - - - 11

II. Poisonous Snakes - - - - - - - 35

III. The Constricting Snakes - - - - - 65

IV. Burrowing Snakes - - - - - - 75

V. Aquatic Snakes - - - - - - - 81

VI. Tree Snakes - - - - - - - - 92

VII. British Snakes - - - - - - - 101

VIII. Enemies of Snakes - - - - - - 114

IX. Land Tortoises - - - - - - - 125

X. Terrapins and Turtles - - - - - 142

XI. Crocodiles and Alligators - - - - 154

XII. A Talk about Lizards - - - - - 167

XIII. The Tuatera Lizard - - - - - - 182

XIV. Legless Lizards - - - - - - - 188

XV. Giant Lizards - - - - - - - - 195

XVI. Geckos and Skinks - - - - - - 205

XVII. Chameleons - - - - - - - - 214

XVIII. Frogs and Toads - - - - - - - 221

XIX. Salamanders, Newts, and their Kindred 238

XX. The Limbless Amphibians - - - - 249

LIST OF ILLUSTRATIONS

A Tame Chinese Alligator - - - - - - *Frontispiece*

facing Page

The Spectacled Cobra - - - - - - - 50

A King Snake eating another Snake - - - - - - 50

A Rattlesnake ready to strike - - - - - - 50

The Bushmaster - - - - - - - - 51

The Puff Adder - - - - - - - - 51

The Rhinoceros Viper - - - - - - - - 51

The Banded Krait or Sankni - - - - - - 70

The Reticulated Python - - - - - - - 70

Anacondas born at the London Zoo - - - - 71

The Diamond Python - - - - - - - - 71

The Indian or Black-tailed Python - - - - - 71

The Boa Constrictor - - - - - - - - 78

The Calabar Snake - - - - - - - - 78

The Indian Eryx or " Two-headed " Snake - - - 78

The Elephant-trunk Snake or Javan Wart Snake - 79

The Copper-head Viper - - - - - - - 79

The Green Whip-Snake or " Eye-poking " Snake - 100

The Skeleton of an Egg-Eating Snake - - - - 100

The Egg-Eating Snake - - - - - - - 100

The Viper or Adder of the British Isles - - - 101

The Smooth Snake, an English Species - - - - 101

The Hinge-back Tortoise - - - - - - - 140

The Starred Tortoise - - - - - - - 140

facing Page
A Galapagos Giant Tortoise - - - - - - - 141
A Snapping Turtle or Alligator Terrapin - - - 141
A Ganges Trionyx - - - - - - - - - 148
The Green Turtle of the "Soup" Fame - - - 148
The Hawksbill Turtle - - - - - - - 149
The Loggerhead Turtle - - - - - - - 149
The Nile Crocodile - - - - - - - - 160
The Marine or Estuarine Crocodile - - - - 160
The Gavial, a Fish-eating Crocodile - - - - 160
Young Mississippi Alligators - - - - - - 161
A Group of Mississippi Alligators - - - - 161
The Banded Basilisk - - - - - - - 180
The Heloderm, the only Poisonous Lizard - - 180
Once Three-eyed, the Tuatera Lizard - - - - 181
The Scale-foot Lizard - - - - - - - 181
The Sooty Amphisbæna - - - - - - - 204
The Grey Monitor - - - - - - - - 204
The Tuberculated Iguana - - - - - - 205
A Verticillated Gecko - - - - - - - 205
The Fat-tailed Gecko - - - - - - - 212
The Stump-tailed Skink - - - - - - - 212
The Warty Chameleon - - - - - - - 213
The Hairy-sided Frog - - - - - - - 213
The Edible Frog - - - - - - - - 236
The Giant Toad with its Dinner - - - - 236
The Black or Alpine Salamander - - - - - 237
The Giant Salamander - - - - - - - 237
The American Cæcilian - - - - - - - 237

CHAPTER I

A TALK ABOUT SNAKES

"WHAT is the use of a snake?" This is a question that the writer has frequently been asked, and although on many occasions he has felt inclined to reply in the words of the modern sage of music-hall fame—"What's the use of anythink? Why, nothink!" it would hardly be respectful to my readers to leave it at that.

Superstition and prejudice follow in the footsteps of snakes (to make use of a somewhat *Irish* expression), and there is little doubt that the majority of people regard them as loathsome, slimy creatures. But they are not in the least degree slimy to the touch; and although some of them may be somewhat repulsive-looking, others deserve to receive our admiration on account of the beautiful mosaic-like pattern that decorates their bodies, and the wonderful colours they exhibit when the sunlight plays upon their scales.

Assuming, however, that the æsthetic aspect is not of sufficient importance to entitle snakes to claim the right of justifying their existence in the eyes of those who decry them, the fact remains that the reptiles hold an important position in upholding what is commonly called the "Balance of Nature," for by killing and eating enormous numbers of rats, mice, and other kinds of vermin, they assist to keep such noxious creatures in check, to the advantage of mankind.

Then, again, snakes themselves form a food supply to many other animals; and although the reptiles would hardly consider it worth their while to be brought into the world merely to be eaten up by some other creature, yet Nature has ordained that a vast number of the animals that populate the earth should exist at the expense of others.

We would also point out that many members of the fair sex who profess to abhor snakes have no objection to wearing shoes made from their skins; while the medical fraternity employ the poison of some snakes, in a dilute form, in the treatment of various human ailments, and viper broth, viper wine, viperine salt, and dried vipers ground up into a powdered state, were formerly regarded as a cure for many ills.

The Æsculapian snake is closely associated with medicine, for it appears on the badge of the Royal Army Medical Corps as the symbol of Æsculapius, the God of Medicine, who was supposed to have appeared in the form of a serpent on several occasions. According to Mythology, the snake was endowed with the gift of being able to discover medicinal herbs, and tame individuals were kept in the Temples of Æsculapius which were regarded as being the first hospitals.

Having, we hope, by the above remarks, shown that snakes are creatures of some utility, we will proceed to discuss their salient features and peculiarities.

A certain schoolboy when asked to describe a snake replied that it was " a thing with a tail right up to its head." This novel definition, however, is not based upon fact, and although it is true that the caudal appendage of some snakes is so long that it exceeds the length of the body, in others it is comparatively short.

The tail of certain kinds of snakes terminates in a hard, horn-like, and pointed process, and in olden days it was a common belief that this appendage was employed by the reptile for the purpose of *stinging*. John Lawson, in his *History of Carolina*, published in 1707, gives a quaint account of one of these "horn snakes." He states: "They strike at their Enemy with their Tail, and kill whatsoever they wound with it, which is armed at the End with a Horny Substance like a Cock's Spur. This is their Weapon. I have heard it credibly reported by those who said they were Eye-Witnesses, that a small Locust Tree, about the Thickness of a Man's Arm, being struck by one of these Snakes at Ten o'clock in the Morning, then verdant and flourishing, at Four in the Afternoon was dead, and the Leaves dead and withered."

In the *History of Virginia*, published in 1722, Colonel Beverley writes as follows: "There is likewise a Horn Snake, so called from a Sharp Horn it carries in its tail, with which it assaults anything that offends it, with that Force that, as it is said, it will strike its Tail into the Butt End of a Musket, from whence it is not able to disengage itself."

A somewhat similar, but even more remarkable, story is that related by a South American negro in regard to a "Hoop-snake." Pointing to a dead tree near at hand, the narrator stated that it had been killed accidentally by the spiked and venomous tail of one of these reptiles. To explain matters more fully, he said that the

Hoop-snake lies in wait for its prey at the top of a slope, and when a prospective victim passes below, it takes its tail in its mouth, and, thereby forming itself into a wheel or hoop, trundles down the hill. On this occasion the snake in question did not roll along in the desired direction, for instead of spiking its would-be victim, it ran into the tree with the disastrous result already described.

Many more incidents of a like nature could probably be gleaned from the pages of old books, but we know nowadays that such stories are but the outcome of a fertile imagination.

Snakes do not possess movable eyelids. Even when slumbering their eyes remain open, and at one time it was commonly believed that the creatures never went to sleep. The absence of eyelids produces the peculiar stony stare that characterizes snakes and is doubtless largely responsible for the strong feelings of aversion that so many people hold towards these reptiles.

As a rule the eyes are of a considerable size in proportion to that of the head, but in some of the burrowing snakes they are minute and of a rudimentary nature. The pupil is circular in diurnal snakes, but in those that lead a more nocturnal life is usually a vertical slit, though sometimes horizontal.

No snake has external ear-openings, and the power of hearing appears to be but feebly developed. The nostrils are usually situated on the sides of the muzzle ; but in the sea-snakes, and in the majority of the fresh-water snakes, they are placed on the summit.

One of the most remarkable phenomena in regard to a snake is the manner of its progression. Although unprovided with limbs, it can travel over the ground, or along the branches of a tree, at a pace far greater than many a four-footed creature is able to accomplish.

How, then, can it manage to do this ?

If we examine the skeleton of a snake we shall notice that the ribs, of which there may be several hundred pairs in some of the large pythons, are but loosely articulated to the vertebral column or backbone, thereby allowing an abnormal degree of movement. The extremities are connected to the broad, shield-like, and slightly overlapping scales upon the under-surface of the snake's body by a series of muscles, and are brought forward in succession like the feet of a caterpillar when walking ; the hindermost and projecting edge of the scales forming a fulcrum or support by means of which the reptile is able to obtain a hold upon the ground and push itself forward.

In other words the creature may be said to walk or row over the surface of the ground upon the points of its ribs.

This method of progression, however, has its disadvantages, for if a snake be placed upon a smooth surface, such as a sheet of glass, the ventral scales are unable to obtain a grip thereon, and, consequently, the reptile is almost helpless, for all it can do is to jerk itself forward in a very laborious manner by alternately throwing its body into coils and rapidly straightening them out again.

Snakes are able to swim by lateral undulations of their bodies, and they can also skim through the grass, or over soft vegetation, in a somewhat similar manner. They never progress by moving their bodies in vertical loops as so frequently depicted in old Natural History books, for the formation of their backbone would not allow of this procedure.

The Cerastes or Horned Viper exhibits a peculiar method of locomotion, for instead of going forward in the usual serpentine manner, it will often progress sideways, like a crab, by wriggling its coils in a curious *non-stop* manner; while an even more remarkable means of progression is displayed by the Bornean Flying-Snake, to which further reference will be found in these pages, for it has been known to take gliding flights through the air in a downward direction by straightening out its body and forming itself into a sort of animated dart.

The entire head and body of snakes is covered with scales that vary in size and distribution in different groups—a fact that is made use of to a large extent in the classification of these reptiles. Curiously enough, it is not always the largest kinds of snakes that possess the largest scales, for those of the Rattlesnakes, for instance, are of superior size in comparison to those of the huge Pythons.

In most snakes the scales beneath the tail are arranged in two longitudinal rows, whereas but a single row of larger ones is present upon the under surface of the rest of the body.

The abdominal scales of the majority of the sea-snakes, however, are of a rudimentary nature, or may be absent ; but as these reptiles (except in the case of one genus) never leave the water, such a development is not necessary for the purpose of locomotion, as it would be were the reptiles non-aquatic.

The scales of a snake are not separable like the small plates that protect the skin of many fish, but form an unbroken and complete covering. From time to time a snake casts its skin—the process, known as "sloughing," consisting of the discarding of the outer layer of its horny epidermis. Prior to sloughing, the reptile is ill at ease and ceases to feed. Its skin has a dried and shrivelled appearance, and the normally transparent shields that protect the eyes, and take the place of the eyelids, become opaque, so that the reptile is unable to see clearly, or may even be quite blind for the time being. It endeavours to relieve its discomfort by rubbing against rocks, stumps of trees, or some other rough surface, and eventually succeeds in detaching from its lips a portion of skin which is pressed backwards over the head. Having thus made a start in *taking off its coat*, the rest is comparatively easy and merely consists of crawling out of the garment ; but during the process the skin that still remains attached to the body is continually being drawn through the detached portion, so that the coat is eventually turned inside out—the tail end being the last to be freed.

It is not always, however, that the skin is cast in this way, for if the reptile be in poor health the sloughing is likely to be accomplished with difficulty, and the skin will probably peel off in pieces or flakes ; while in the case of the sea-snakes the coat is never cast whole.

A snake is only seen at its best after it has sloughed, for then its skin no longer looks like dried parchment, but shines as if it had been varnished. Moreover, the pattern and colouring receive renewed intensity and brilliance, and the reptile itself regains its normal vigour and vitality. No longer does it suffer from lethargy and discomfort. Life is worth living once again, and, with a keen appetite after its fast, it hunts around for something substantial to eat.

A snake does not shed its skin at regular intervals, for the process is governed to a large extent by the age, health and environments of the reptile. Newly born snakes, however, change their coat when they are two or three days old, and again after a period of about a fortnight ; but as they grow older the changes are less frequent and more irregular.

The early sloughing of young snakes is due to the rapidity with which they grow, for they soon burst out of their baby clothes and require new ones. Fortunately, however, Nature provides them with the necessary outfit free of all expense—a circumstance that human parents have just cause to envy.

Even when adult, snakes will sometimes cast their skin very frequently, and a Rat-snake at the London Zoological Gardens shed its coat nine times during the course of a year—the dates being January 3rd, March 15th, May 9th, July 2nd, August 9th, September 25th, October 12th, and November 18th. On the other hand, an Indian Python which sloughed on July 31st and September 2nd, did not afterwards renew its coat until February 19th of the following year.

Let us now examine the tongue of a snake. If we were to open the mouth of one of these reptiles, it is more than likely that we should not see that member, for it can be entirely withdrawn within a basal sheath that lies on the floor of the mouth. But when the creature is on the move, the tongue is much in evidence, and is continually being protruded with a flickering motion beyond the reptile's lips. It will be noticed that the tip is bifurcated and divided into two long, slender, and pointed filaments, and that the snake does not open its mouth when exerting its tongue, but passes it through a small opening between the lips. Many people on seeing a snake's tongue darting in and out of its mouth immediately exclaim, *Oh! look at its sting.* But a snake does not possess a sting, not even the poisonous species, for the latter inject their venom through the agency of specially-developed teeth or fangs. The tongue is perfectly harmless, and is so soft and pliable that it could not puncture a piece of tissue paper. It is chiefly employed as an organ of touch, and, like the whiskers of a cat, aids the reptile in feeling its way about. Possibly it may also be used to a modified extent for the purpose of collecting moisture from the leaves and herbage, although the usual method of procedure when a snake drinks is to put its mouth right into the water. There is every reason to believe, however, that the tongue is of little or no use as an organ of taste ; for a creature that swallows its prey whole, and without biting it, cannot possibly enjoy the flavour of its meal.

It has been suggested that the tongue is in some mysterious manner associated with the sense of smell. One writer supports this theory by stating that when an egg-eating snake comes across an unbroken egg, it feels the same all over with its tongue before making up its mind to swallow the dainty. Should the egg be a fresh one, the reptile proceeds with its meal, but it invariably rejects a bad one.

Although we do not wish to reject the possibility of such a theory being correct, we would point out that snakes which feed upon newly killed prey behave in the same manner, and that in their case there can be no question of the food being tainted.

The old belief that a snake licks its prey all over so as to lubricate it and render it the more easy to swallow is one of the myths that still lingers in the minds of many people.

It is true that the reptile is endowed with an abundant supply of saliva which assists the act of deglutition, and that the mere sight of food is sufficient to make a hungry snake *water at the mouth* very freely ; but if we consider the size of a snake's tongue in relation to that of its prey, it will be realized that to cover a victim with saliva in the manner suggested would be comparable to painting a large shed with a camel-hair brush.

The majority of snakes are endowed with a formidable array of teeth. In the harmless or non-poisonous species there are usually two rows on either side of the upper jaw, and a single row in the lower jaw, making six rows in all ; but in the burrowing snakes teeth may be absent in either the upper or lower jaw.

Some of the venomous snakes also possess six rows of teeth, others only have four, but all are provided with specially developed poison-fangs which may be situated either in the front or at the back of the upper jaw. Further reference to these, however, will be found in a subsequent chapter.

The teeth are not firmly fixed in sockets, and are renewed from time to time throughout the life of their owners. They are not adapted for chewing or rending, but for grasping; those of the majority of species being directed backwards in such a manner that when the reptile obtains a firm grip upon its prey it is unable to leave go.

That snakes at one time possessed limbs is made manifest by the rudiments of hind legs that are present in a few species, such as the pythons and boas. These growths take the form of spur-like developments arising from the under surface of the body, at the base of the tail, and are more noticeable in the males than in the females.

It may come as a surprise to some readers to hear that certain snakes possess a voice. The Bull snake, the largest of the North American non-poisonous species, is able to produce a loud bellowing sound that can be heard at a distance of thirty yards or more, and has been compared to the noise of distant thunder; while the Indian Rat-snake will sometimes utter a peculiar cry like the tones produced by gently beating upon a tuning-fork.

Many snakes, when annoyed, will hiss by

violently expelling the air from their lungs; the Puff-adder being one of the most expert in this procedure, for when thus engaged it gives rise to a prolonged noise suggestive of that produced when a soda-syphon is being emptied of its contents.

Then there are snakes that produce sounds by other means than through the agency of their lungs. The Rattlesnakes, for instance, make their presence known by rapidly vibrating their tails, the extremity of which terminates in a rattle composed of a number of loosely-connected and horn-like segments; while the Carpet Viper and the Horned or Cerastes Viper are able to make a loud, rustling noise by rubbing together a series of prominently ridged scales that are present upon the sides of their bodies.

The vitality of snakes is remarkable. They can fast for weeks on end without suffering any ill effects, and can live for a long time with their brains removed and without a heart. If the head be severed from the body, the latter will continue to wriggle about for some time, the jaws will open and close, and the tongue will be protruded and withdrawn. Curiously enough, however, a slight blow with a stick upon the tail will break the creature's spine and cause its death in about a minute.

It is a popular belief that snakes are able to fascinate their prey in some mysterious manner; but such a supposition is erroneous, although it is possible that some creatures may be to a certain extent paralysed with fear when brought suddenly face to face with such reptiles. It is true that birds have been seen fluttering quite close around a snake in a very excited state, but this behaviour on their part might have been due to the fact that one of their number had just been caught and eaten by the reptile, or they may have approached near in order to investigate the nature of its quivering tongue, which, from an avian point of view, looks like something good to eat.

Birds that have been placed in the cage of a captive snake as food have been known to peck at the reptile's tongue; while, moreover, the writer has seen rabbits, guinea-pigs, and white rats run over the coils of snakes in a manner that clearly showed the creatures had not the least idea they were in danger of being eaten, and were in no way *fascinated* by being in such close contact with the reptiles. Another point that might be mentioned in regard to this question is that a poisonous snake bites its victim and then usually releases it and waits for it to die before commencing to feed. The bite causes the victim to become dazed and more or less paralysed, and anyone seeing a snake waiting for its prey to succumb under the influence of its injected venom might easily imagine that the helpless condition of the latter was due to some spell, fascination, or hypnotic power exercised by the reptile.

The food of snakes is of a very varied nature and consists chiefly of mammals, birds, lizards, frogs, and fish ; but some of them are very partial to eggs, and a few feed entirely upon insects. The larger species can swallow a creature as big as a young deer or calf, but the smaller ones content themselves with less bulky fare.

Cannibalism is a practice indulged in by certain kinds of snakes—the North American King Snake, the Harlequin or Coral Snake, and the Hamadryad or King Cobra being familiar examples. The latter feeds entirely upon snakes, both poisonous and otherwise, but the first-mentioned likes a change of menu and also partakes of small mammals, birds, and lizards. Mr. Ditmars tells us that he " has observed the Harlequin Snake swallowing snakes that were but a few inches shorter than the feeding reptile, and of greater circumference of body. After completing a meal of such proportion, the gorged snake is rendered so rigid of body that it is unable to coil properly, and the skin is so greatly distended that the scales appear as well-separated rows of dots."

It sometimes happens that snakes are involuntary cannibals and swallow another of their kind because they can't help doing so. This may appear a somewhat strange statement to make, but such incidents have occurred on several occasions at the London Zoological Gardens when two snakes commence to feed upon the opposite ends of a rabbit or some other creature. When once they have started their dinner they continue until the mouth of one reptile touches that of the other. This is a critical moment for both of them, for the one that takes the next bite gets its jaws over those of its companion, and thenceforth continues to swallow the unfortunate victim.

The keepers at the Zoo, however, are ever on the watch for incidents of this kind, and not infrequently they are able to rescue a snake before it has entirely disappeared down the throat of another one. Not long since a King Snake was seen busily engaged in swallowing an inmate of its cage, and only a few inches of its tail remained visible. Rushing to the back of the cage, the keeper unfastened the door, seized hold of the culprit forced its mouth wide open, and dragged the victim backwards inch by inch until its head once more appeared in view. The rescued individual was none the worse for its experience, and shortly afterwards proceeded to feed upon some mice. On another occasion, in the days when the snakes at the Zoo were given live food, a rabbit was placed in the cage of a Boa Constrictor that was unable to see very well owing to the fact that it was about to cast its skin. The reptile made a grab at the rabbit, but, instead of securing its prey, its jaws fastened upon a blanket that was provided as a shelter for the snake, and to keep it warm. As this object felt very much like the furry coat of the rabbit, the Boa proceeded to swallow its bedclothes without noticing that anything was amiss ; but it was not allowed to purloin the property of the Zoological Society in this manner, and was eventually forced to disgorge its strange repast. This incident only goes to confirm what the writer has already stated in regard to a snake having " little or no sense of taste."

All snakes drink very freely, and many of them are very fond of milk. In India, the natives will place saucers full of milk near the hiding places of Cobras, or in the Temples where they are worshipped, in order to propitiate the reptiles ; while the Racer or Whip Snake, to quote the words of Lawson, " haunts the Dairies of careless Housewives, and never misses to skim the Milk clear of Cream."

Some snakes are said to suck the udders of cows in order to procure milk, but this is merely one of the Natural History fairy tales that gets handed down from one generation to another.

Various methods are employed by snakes for killing their prey. The constricting snakes crush their victims to death with their coils, while others, which may be termed semi-constrictors, hold their prey with a single coil, or press it to the ground with their bodies, and then proceed to eat it alive.

The poisonous snakes inject venom into their victims' bodies through the agency of their poison fangs. When once they have inflicted a bite, the majority of them release their prey and wait for the venom to take effect before proceeding with their meal; but others retain their hold until death ensues, and then start to feed. A few species will commence to eat without waiting for the death of a victim—a practice that is followed by the non-constricting snakes.

It often happens that snakes in captivity will refuse to feed, and although they are able to fast for a long time without suffering any inconvenience, there is a limit to their powers of abstention.

In obstinate cases forcible feeding has to be resorted to, the food being gently but firmly guided down the reptile's throat with the aid of a short stick.

As a rule snakes commence to swallow their prey head first.

The process of deglutition is a somewhat lengthy one, and, judging by appearances, is not accompanied by the sense of gratification that one usually associates with taking a meal.

Not only do they swallow their prey whole, but they will dine upon creatures that are far greater in bulk than themselves ; and in order that they may successfully accomplish this feat, Nature has provided them with jaw-bones that are but loosely joined together by elastic ligaments. The two halves of the lower jaw are separable at the chin, and in the majority of snakes the bones of the upper jaw are also very loosely articulated. It should be pointed out, however, that this arrangement does not apply to those snakes that feed entirely upon small prey.

The digestive power of a snake vies with that of the ostrich, for the bones, and very often the teeth, of a victim are completely dissolved by the reptile's gastric juices. The claws of a mammal, however, are usually evacuated, as also is the fur which is so little affected by the digestive secretions that the identification of the creature can generally be traced.

The reader may well enquire how it is that a snake does not choke when its mouth is stuffed so full that its jaw-bones are forced asunder. In all probability the reptile would suffer this fate were it not provided with a special development of the tubular structure, known as the glottis, that leads to the windpipe. Now under normal circumstances this lies in repose within the snake's mouth, but when the creature is feeding it causes the open end of the tube to project forwards to such an extent that it may even protrude beyond the lips, and in this way a free passage is ensured for a supply of air to the reptile's lungs.

All snakes originate from eggs. In some species the young are hatched within the shelter of their parent's body and emerge as fully formed snakes, but in others the female lays her eggs, and the young ones afterwards break out and start a free existence—the term viviparous being applied to those snakes that reproduce their kind in the former manner, while the others are called oviparous. The eggs, which are provided with a somewhat leathery shell, are oval in form. They are produced one at a time, but owing to the fact that they are covered with a sticky secretion, they afterwards adhere to one another and form an irregular-shaped mass.

The majority of oviparous snakes deposit their eggs in the earth, under sand, or amidst decaying vegetation, where they are left to hatch under the influence of the sun's rays, or by generated heat. Some of them, however, assist in the incubation of the eggs by coiling their bodies around them, and at such times their bodily temperature rises above the normal and may exceed that of the surrounding atmosphere by ten degrees or more—especially if the temperature be taken between the reptile's coils instead of upon the surface thereof.

The number of eggs laid by different forms of oviparous snakes is very variable, some of them producing more than a hundred at a time, while others may be content with but two ; while in regard to the viviparous species, certain kinds may only have moderate-sized families, and others are more prolific—the Mole or Hoary Snake, for instance, bringing eighty or more young ones into the world in a litter.

Although snakes that inhabit tropical countries remain active throughout the year, except during times of drought, those in more temperate regions hibernate during the winter months, and are often found huddled together in vast numbers.

As soon as the cold weather sets in they retire to their hiding places where they remain in a torpid condition until the return of the spring sunshine awakens them to activity.

They do not partake of food during this period; but as their vital forces, such as blood-circulation and digestion, almost cease to function, the reptiles are able to keep alive by absorbing into their systems the coating of fat that they had previously accumulated upon their bodies.

CHAPTER II

POISONOUS SNAKES

ON turning over the pages of the current number of a popular journal, the writer happened to see an article headed, " *New Discoveries about Snakes and other Poisoners.*"

Among the various statements made therein we quote the following : " Although snakes have been sharply classified into venomous and non-venomous, recent experiments by two well-known French scientists, Dr. C. Phisalix and his wife, Madame Marie Phisalix, have now overturned this old idea. The pair spent years examining the glands and saliva of every known snake, and their conclusion is that all snakes are venomous."

This was a rather startling fact to have thrust before one who was about to prepare the present chapter of this book, for what would be the use of devoting a separate chapter to poisonous snakes if all were poisonous ? Fortunately, however, for the writer's peace of mind, the above remarks were supplemented by the following paragraph: "They found that both the blood and the saliva of every ophidian are more or less poisonous. *When their dentition, or tooth machinery, is complete* the saliva at once penetrates the minute wounds made by the fangs. The great boa-constrictor, which has been hitherto supposed to kill entirely by wrapping its coils around its prey and pressing it to death, and which has been supposed to be entirely non-venomous, is quite the reverse."

Although the present writer feels it to be somewhat presumptuous on his part to criticize the statements of the above-mentioned eminent investigators, he feels that the words he has placed in italics qualify the remarks to such an extent as to show clearly that all snakes are not poisonous in the sense that they are able to kill by biting and ejecting venom into a victim's flesh, but only those endowed with specially developed poison-fangs.

We do not dispute the fact that the saliva and blood of snakes may be of a poisonous nature when injected experimentally into the veins of other creatures, but, surely, this circumstance hardly justifies one in calling all these reptiles poisonous. Were we to do so we might just as well call a horse or a cat poisonous, for we know that a bite from these quadrupeds may prove to be very dangerous, or even fatal.

Having cleared our conscience by the above dissertation, we feel justified in continuing our work, and, without further hesitation, following the universal practice of classifying the poisonous snakes as a distinct group that are endowed with special characters and properties not found in the others.

How can a venomous snake be distinguished from a non-venomous one ?

This is a question that everyone is more or less interested in, although in this country the solution does not affect us to such an extent as those people living in tropical regions, for of the few reptiles indigenous to the British Isles, only one is poisonous.

But the reply to the query is likely to prove somewhat unsatisfactory to those who seek for information, for the only sure way of distinguishing between the venomous and the harmless snakes is to examine their teeth—a method that may be likened unto putting one's fingers into boiling water to see if it be hot. If they have poison-fangs it is as well to make the investigation as brief as possible, unless we are an expert in handling the reptiles, but otherwise we may admire their dental array without fear of disastrous results ensuing.

Of course, one may learn to recognize a poisonous snake by sight, and thus dispense with the necessity of gazing into its open mouth in order to solve any doubt that may linger in our minds as to the reptile's character, but most people's knowledge in such respect is limited to but a few species.

Poisonous snakes are divided into three groups, according to the nature and position of their fangs. The first division, known as the back-fanged snakes, differ from the others by having the fangs situated at the back of the upper jaws, instead of at the front ; while the distinguishing feature between the two groups of front-fanged snakes is that in the vipers the fangs are attached to a short, movable bone, and can be elevated or depressed in a vertical plane at will. The back-fanged snakes were at one time regarded as being harmless ; but it is now known that they are poisonous, although the venom of the majority of species is not sufficiently powerful to cause death in mankind.

The poison-fangs of snakes are not all designed on the same plan. In the most deadly species, as exemplified by the vipers, they are caniculated or pierced by a slender channel ; while in the group known as poisonous colubrines the fangs are merely provided with a groove on the surface that serves for the conveyance of the venom, or the channel may be of an intermediate character between the two types. The fangs are shed from time to time, and are replaced by others that lie behind in various stages of development, the foremost of which are ready to come forward and take the place of those previously in use.

The venom is secreted by glands that are specially modified salivary glands. They are situated behind and below the eyes, one on either side, and in some instances extend along the sides of the body for a considerable distance ; while a layer of enveloping muscles, that are brought into play when the reptile is biting, force the venom down the duct of the poison-fangs. Certain species of cobras, however, to which further reference will be made in this chapter, are able to discharge their venom without actually biting upon an object, but this method of attack is not so effective as when the poison is introduced into the blood of a victim through the direct agency of the teeth.

The venom of snakes is a translucent and pale yellow fluid. As a rule it is tasteless, but that of the cobra possesses an extremely bitter flavour. Notwithstanding the deadly nature of snake-venom when introduced into the blood of a victim, it can be swallowed with impunity by a person who is perfectly healthy ; but anyone suffering from internal complaints accompanied by weakness of the throat or stomach membranes would run the risk of the venom being absorbed into the system with results that would in all probability prove fatal.

Not only does the virulence of the venom vary considerably in different species of snakes, but a great deal depends upon the vitality of the reptile at the time of biting a victim, and whether it has lately exercised its powers in such respect. No snake is endowed with an unlimited supply of venom, and each successive bite results in a diminished and less virulent flow. A period of rest, however, is all that is necessary to enable the reptile to regain its normal power, for a fresh store of venom is gradually formed to replace that which has been discharged.

Snake poison retains its venomous properties for a great length of time, and when stored in a dried state in a tightly-corked bottle keeps its potency for an unlimited period. Venoms in a solution of water, however, do not keep.

The symptoms produced in man as a result of the bite from a poisonous snake vary very much according to the species of reptile that has inflicted the bite, and are also largely governed by the amount of venom injected into the wound.

In the case of a cobra bite, the first symptom that is noticeable is a burning sensation at the seat of inoculation, and the surrounding flesh becomes swollen, red, and tender to the touch. After a lapse of about half an hour, sleepiness and a sense of weakness in the legs ensues, and this is followed by paralysis of the tongue and larynx, as well as by vomiting.

The paralysis then spreads to other parts of the body, so that the victim is unable to move, and death usually follows as a result of the respiratory organs and the heart becoming affected. It sometimes happens, however, that a patient succeeds in passing through this critical stage, in which case his recovery is rapid and complete.

The bite of a rattlesnake is accompanied by very distressing and painful symptoms. Swelling and discoloration arise at the seat of the wound, and in the course of about fifteen minutes the patient's pulse becomes quick and feeble. His pupils are dilated, he breaks out into a cold sweat and vomits freely, he staggers about like a drunken man, and shows signs of mental disturbance. This condition lasts for about twelve hours, and frequently ends in the death of the patient; but should he manage to get through this ordeal, he has to face new developments. The swelling and discoloration commences to spread to an alarming degree, and this state of affairs is accompanied by a rise in the victim's temperature, and sometimes by delirium.

Even if death does not release the sufferer at this stage, and he is on the road to recovery, mortification of the flesh may set in and prove fatal, even after a lapse of several weeks.

Reserving our remarks upon the venomous adder found in this country to the chapter devoted to British snakes, we will pass to a more pleasant subject and consider the various remedies and methods of treatment that are recommended in the case of a bite from a poisonous snake.

The first thing to do when a person is bitten is to endeavour to prevent the venom from circulating through the blood-vessels by placing a ligature around the limb, just above the wound. It is necessary to have the bandage very tight, and the best method of ensuring this is to place a short stick beneath the ligature, on the side away from the wound, and then twist it round and round. Having thereby prevented the venom from spreading, the wound should be deeply lanced in all directions, even down to the bone, so that the poison can be carried away in the flow of blood that issues from the cuts. In the case of a toe or finger, however, instant amputation is the best method of procedure ; while if the wound be in a fleshy part, a red-hot iron, a piece of glow-coal, or burning acids should be forced into the affected parts, after which some gunpowder can be placed in the cavity and exploded. These remedies are certainly of a very severe nature, but the occasion calls for instant and drastic treatment.

A more popular method of procedure, and one that can be resorted to when a victim is alone and has nobody to administer to his needs, is to swallow as much brandy or whisky as possible with a view to arriving at the condition commonly known as "dead drunk." A quart of neat spirit may produce the desired effect, but it is astonishing what an enormous quantity can be swallowed by a patient without causing intoxication. Indeed, to get drunk under such circumstances appears to be a somewhat difficult matter. We are told that a girl, aged fourteen, who was bitten by an Australian venomous snake, did not show the least signs of being intoxicated even when she had consumed three bottles of brandy ; while a quart of brandy and half a pint of whisky were required to produce but a slight state of drunkenness in a man who was suffering from a snake bite. Although it appears that the alcoholic treatment is very effective in many cases, it is one that is liable to be abused, for the negroes that work in the plantations where venomous snakes frequently occur have been known to indulge in the practice of pricking a finger with a thorn, and, with appropriate contortions of their bodies, exhibit the wounded member as having been bitten by a snake. We may imagine, however, that the success attending this ingenuous method of obtaining the grateful and beneficial dope depends upon the number of times the individual has previously resorted to it, and also the degree of credulity displayed by the boss.

In former days it was believed that the saliva of a human being would kill a viper, and we are told that the Hottentots destroy the puff-adder by spitting into its mouth. Such stories, however, require confirmation, and in any case it would appear more likely that the death of the snake would be caused by some drug that the natives are in the habit of chewing, or be brought about by the juice of tobacco which is frequently employed by the American backswoodmen as a poultice for applying to a snake's bite.

From very ancient times it has been a common practice for the inhabitants of those countries where poisonous snakes abound to inoculate themselves with venom, or swallow doses of the poison, for the purpose of rendering themselves immune against the danger arising from the bite of these reptiles.

The Rev. John Campbell, writing as far back as 1813, states that it is "very common among the Hottentots to catch a serpent, squeeze out the poison from under his teeth, and drink it. They say it only makes them a little giddy, and imagine that it preserves them afterwards from receiving any injury from the sting" (bite) "of the reptile."

A further interesting contribution bearing upon this subject is given by Sir Thomas R. Fraser in an article that appeared in the issue of the the well-known magazine, *Nature*, published in April, 1896. He writes: "The Psylli of Africa, the Marsi of Italy, the Gouni of India, and other ancient tribes and sects, were stated to have been immune against serpents' bites, and this immunity has been explained on the supposition that the serpents' blood was present in the veins of the members of those tribes and sects."

Then, again, Drummond Hay, in his work on Western Barbary, published in 1844, gives an interesting account of a sect of snake-charmers, called the Eisorvy, who allowed themselves to be bitten by venomous snakes without suffering any ill effects. The explanation of how they gained immunity against the bites of these reptiles is as follows. The founder of the sect, named Seedna Eiser, was followed through the Soos desert by a great crowd of people, but after a time they became hungry and clamoured for food. This request raised the ire of Seedna Eiser, whereupon he turned upon the multitude and cursed them in the Arabic words, "*kool sim*," meaning "eat poison." So great was the belief of the men in the wisdom of their venerated leader that they interpreted his words in the literal sense and from thenceforth commenced to eat venomous snakes with the result that, according to tradition, they and their descendants became immune against snake bites.

Mr. Alford Bolton also gives some interesting information in a contribution to the *Lancet*, in 1866. "The most deadly snakes here," the narrator writes, "are the puff-adders, the yellow cobra capellas, the horn-snakes, and the night-adders. Whilst frequently hearing of horses and cattle rapidly succumbing to the bite of these snakes, it appears strange that the natives themselves, who mostly ramble about the Veldt almost naked, seldom or never appear to suffer any further inconvenience from the bite of poisonous snakes than would be usual from any accident which would cause local inflammation, and, on close enquiry, I found that the natives in Bushmanland, Namaqualand, Dumaraland, and the Kalakari, are in the habit of extracting the poison-gland from the snake immediately it is killed, squeezing it into their mouths, and drinking the secretion, and that they thereby appear to acquire absolute immunity from the effects of snake bites."

That immunity against a poison can be gained by accustoming oneself to mild but repeated doses is well exemplified in the case of a confirmed and heavy smoker ; and although we do not go so far as to say that the nicotine from the tobacco is not detrimental to his health, there is no disputing the fact that he is able to indulge in what many people may call the *pernicious habit* to an extent that would make the novice feel very uncomfortable.

It is generally acknowledged that some of the Indian snake-charmers are able to withstand the effects of a snake-bite because they have been bitten so often that they are thereby rendered immune against the venom ; but, on the other hand, certain individuals that follow this picturesque calling work on the *safety first* principle and extract the reptile's teeth. Many snake-charmers carry what is called a snake stone, or *Pamboo-Kaloo*, which is supposed to heal a cobra's bite by merely being placed for about fifteen or twenty minutes upon the wound. Although it is difficult to believe that a stone could be endowed with healing properties, yet those who have witnessed the proceeding state that there appears to be no doubt as to the efficiency of the treatment. But the Oriental mind is capable of evolving so many tricks that one is apt to regard such marvellous displays as somewhat unconvincing, more especially as we have already seen that immunity may be attained by other means which would render the application of a snake-stone quite unnecessary.

Nowadays more modern methods are employed when dealing with the bite of a poisonous snake, the practice being to inject anti-venom serum into the blood of a patient. Unfortunately, however, the venoms of snakes are not all alike, and a serum that may prove to be effective against the poison of one species may be inoperative against another, and this leads to the further difficulty that very often the victim of a snake-bite is unaware of the nature of the reptile that inflicted the wound.

In India more than twenty thousand deaths are caused every year by the bite of venomous snakes, and as the Cobra and Russell's Viper are the ones that are responsible for causing the greater number of fatalities, the Pasteur Institute of India have prepared a serum that can be employed with equal success in the case of both of these snakes.

The serum is obtained by injecting small but increasing quantities of snake-venom into the blood of rabbits, horses, or other animals, in a similar manner as vaccine or lymph is obtained by injecting the germs of small-pox into calves. After several months of treatment some blood is drawn from the inoculated animals, and as this forms into a clot a clear fluid is given off which constitutes the serum or antivenine. This is afterwards purified and placed in hermetically-sealed glass tubes, ready for dispatching to any part of the country where it may be wanted.

As a large number of snakes are required for the purpose of extracting their poison, owing to the fact that each one yields but a limited supply, it is the custom to capture and keep them in captivity so that they may be ready when needed. The handling of the reptiles is a highly dangerous work, and only a person endowed with the qualities of coolness and pluck can successfully undertake it ; but, as in the case of other difficult and risky jobs, familiarity breeds contempt and the man who is used to the occupation thinks no more of handling a deadly cobra or a Russell's viper than of stroking a cat.

Let us then see how the venom is extracted from the snake's fangs. Having selected a specimen for the operation, the man pins the reptile to the ground by placing a forked stick behind its head. He then grasps the back of the head with his forefinger and thumb, and in this manner is able to lift the snake without the risk of being bitten. An assistant then holds a wine-glass or a small glass pan, covered with a piece of parchment or American cloth, before the creature's mouth, and the reptile is induced to bite upon the substance. Its fangs penetrate the cloth, and drops of venom fall to the bottom of the glass ; after which it is dried and made ready for injecting into the animals that are employed for that purpose.

Antivenine is also prepared from the American poisonous snakes at the Institute of Serum Theracy, in the city of Butantan, San Paulo. Attached to this establishment is a snake-farm, where rattlesnakes, bushmasters, and other venomous serpents are kept. The reptiles are confined in a large grass-bedded enclosure, surrounded by a ditch filled with water, as well as by a cement wall ; while numerous gravel paths lead to curious dome-shaped and hollow structures that look like miniature mud-huts or old-fashioned bee-hives. The base of each of the latter is pierced by several arched openings or doorways, so that the reptiles can enter or leave their domiciles at will.

Although about two thousand different kinds of snakes are known, only a third of them are endowed with poison glands ; while the number that are able to produce death in man is about one hundred and fifty.

The Harlequin coral-snake, found in Eastern North America, Mexico, and Central America, is regarded as the most venomous snake. It attains a length of about two feet, and its body is decorated with black, red, and sometimes yellow bands. When attacking its prey it bites in a manner unlike that of the majority of snakes, for instead of throwing its head suddenly forward to strike, and afterwards drawing it back again and releasing its hold, it proceeds in a very leisurely way to fix its jaws into its victim's flesh, and then retains its hold with the tenacity of a bull-dog's grip.

The cobras, of which there are eight species found in Southern Asia and Africa, are other very dangerous snakes. When annoyed and about to strike, they elevate their heads high into the air and expand the skin of their necks into the form of a hood. In the typical Indian cobra, or Cobra de Capello, the back of the hood is decorated with a light-coloured mark that takes the form of an inverted pair of spectacles, for which reason the reptile is often called the Spectacled-snake; but in Northern India and South-East Asia there is a variety in which the marking assumes an irregular and somewhat rounded mask-like design, while others have no pattern at all on the hood. The natives of Bengal call the Spectacled-cobras by the name of *Gokurrahs*, and those with the ocellated or rounded pattern are spoken of as *Keautiahs*.

Notwithstanding the deadly nature of cobras, they are still worshipped in certain parts of India, and their presence in a house is considered to be of good omen, much as a black cat is supposed to bring good luck. No Hindoo will willingly kill a cobra, and Colonel Meadows Taylor tells us that should one of the reptiles be accidentally slain within the precincts of a village, a piece of copper money is placed within its mouth, and its carcase, together with appropriate offerings, is burned so that no harm may ensue.

According to tradition, the cobra originally possessed seven heads, and these are now represented by the hood. The two rings that help to form the spectacle marking, moreover, are supposed to represent the footprints of the god *Krishna.*

The Indian cobra has been known to measure over seven feet in length. It mainly confines its activities to the night-time, although not infrequently it can be seen abroad in daylight. Small mammals, birds' eggs, frogs, and fish form its staple food supply, in the capture of which it exhibits remarkable agility.

There is an old story that in Ceylon the cobra is in the habit of carrying in its mouth at night a luminous pebble (probably a piece of fluor spar) by means of which it attracts the creatures upon which it preys ; but, needless to say, the yarn is entirely devoid of truth.

The venom of a cobra acts very quickly, and but a small quantity is required to kill any creature that may happen to be bitten by one of the reptiles It is recorded that a cobra kept in captivity killed six fowls, a pigeon, and a dog in succession within the space of a few minutes, and that a seventh fowl that was also bitten at the time managed to recover from its injury owing to the fact that the supply of the reptile's venom was for the time being exhausted.

With the King Cobra or Hamadryad we come to the largest and most aggressive of the cobras. It attains a length of fifteen feet, and is found in India, Burma, Siam, the Malay Peninsula, and Southern China ; but nowhere is it very common. It feeds entirely upon other snakes, and a captive individual that formerly lived at the London Zoological Gardens ate no less than eighty-two of its kindred in less than a year.

Not long since the writer witnessed one of these reptiles in the act of making a meal of another snake. Although the spectacle was of a very gruesome nature, and one could not but feel sorry for the victim, yet there was a strange fascination in watching the manner in which the creature dealt with its prey. Seizing the latter across the middle of its body, the Hamadryad commenced to work its jaws sideways with a creeping motion, and, without releasing its grip, gradually drew the struggling victim through its mouth until its head was reached. Having accomplished this, the diner then proceeded to swallow its dinner head-first, and in a very few minutes nothing remained visible to reveal the tragedy that had just been enacted.

There are several species of African cobras that go by the name of "spitting snakes," because of their power of ejecting their venom from their open mouths. The Black-and-white

Cobra, and the Black-necked Cobra, will occasionally indulge in this method of attack, but the Ringhals snake, which is closely allied to the true cobras, but differs therefrom by the keeled nature of its dorsal scales, is an expert at such a procedure.

It is not a pleasant customer to come across, for it always aims at the eyes of a person, evidently being aware of the fact that should the venom reach its mark the victim will be wholly or partially blinded. Moreover. the snake can eject its venom for a distance of three yards, and when captive specimens have to be attended to the keepers take the precaution of wearing motor-goggles.

The bite from one of these reptiles nearly always proves fatal, and, according to Mr. FitzSimons, the snake is able to eject from five to ten drops of venom at a time, a single one of which is sufficient to kill a man. The species is very prolific, and a female may have a brood of as many as seventy young ones.

With the rattlesnakes we come to some serpents that are easily recognized by the curious horny appendage, known as the rattle, that arises from the end of their tails, and by means of which they can produced a sound like the rustling of dried leaves.

They "carrie upon the Tippe of their Tayle a certaine little roundelle, like a bell , which ringeth as they goe," says a writer in olden days ; while John Clayton, in his *Account of the Beasts in Virginia*, published in 1694, tells us that : "The Tayle is composed of perished joynts like a dry Husk. The Old shake and shiver these Rattles with wonderful Nimbleness ; the Snake is a Majestick sort of Creature, and will scarce meddle with anything unless provoked."

The rattle is composed of a number of flattened, horny, and hollow segments which fit loosely into one another. That of a young rattlesnake, however, only consists of a single button-like structure, but as the reptile grows up additional sections are added. Some writers say that a new segment is added to the rattle every time the snake sheds its skin, while others are inclined to doubt the truth of this statement ; but in any case the number of segments that forms the rattle does not indicate the age of the reptile, for it may cast its skin several times during the course of a year, while, moreover, the terminal portion of the rattle often gets worn and drops off.

The American Indians hold the curious belief that the rattlesnake adds a new segment to its rattle every time it kills a human being—a fanciful idea that almost seems to reflect upon their own ancient custom of celebrating the killing of an enemy by taking off his scalp as a trophy of their prowess. The largest rattle ever recorded was one that consisted of forty-four segments, but this was exceptional and of double the size of the finest examples possessed by the present-day rattlesnakes.

Although many theories have been propounded as to the use of the rattle, the subject is one concerning which no definite conclusions appear to have been arrived at. Some authorities assert that the sound it produces acts as a warning signal or an alarm ; while others take just the opposite point of view and regard the noise as a lure by means of which the snake attracts its victims to their doom. It has also been suggested that the rattling is in the nature of a call-note whereby one snake is able to make known its presence to another—a theory which, although by no means an unreasonable one to put forward, could easily be enlarged upon by a person gifted with an imaginative mind, for what would be more interesting than to visualize them answering one another in the *dot and dash* of the Morse code, or altering the *wave-length* broadcasted through the medium of their tails so as to *cut out* a *listener-in* at another station.

That Darwin did not believe the sounds were produced as a warning note is clearly shown by the following quotation taken from his well-known book the *Origin of Species*, in which he states : " It is admitted that the rattlesnake has a poison-fang for its own defence and for the destruction of its prey ; but some authors suppose that at the same time it is furnished with a rattle for its own injury, merely to warn its prey. I would almost as soon believe that the cat curls the end of its tail when preparing to spring in order to warn the doomed mouse. It is a much more probable view that the rattlesnake uses its rattle, the cobra expands its frill, and the puff-adder swells whilst hissing so loudly and harshly, in order to alarm the many birds and beasts which are known to attack even the most venomous species."

In olden days rattlesnakes were made use of for medicinal purposes in the cure of leprosy, and even at the present time their venom is employed in the Homœopathic treatment of yellow fever. The American Indians consider the snakes to be endowed with medicinal properties, and they also convert their rattles into necklaces and ear-pendants. The reptiles are regarded with a considerable degree of veneration, and we are told that should one of them happen to cross the path of the natives during their journeyings, they considered its presence as a warning and a sign that they must not proceed any further in the direction they were going.

Rattlesnakes, of which there are a number of different species, are found in the United States, Mexico, and Panama. The largest attains a length of eight feet or more, but in the Pygmy Rattlesnake we have an example which is a dwarf of its kind, a full-grown individual rarely measuring more than two feet in length. Although the latter possesses a rattle upon the end of its tail, this is so small that, when vibrated, it can only be heard for a distance of a few feet. The reptile's bite, moreover, seldom proves fatal to mankind provided prompt measures of treatment are taken.

Rattlesnakes are of a very timid disposition, and for this reason they rarely thrive well in captivity. More frequently than otherwise they refuse food and have to be forcibly fed, but this treatment is liable to cause death through shock.

Another very venomous and dangerous snake is the Bushmaster, which comes from South America and Trinidad ; the largest specimens, which occasionally attain a length of fourteen feet, being found in Brazil and British Guiana. It frequents the damp forests, and is very fond of hiding within the burrows of armadillos and other animals. In Brazil it is known as the *Surucucu*, while in Central America it is often called the pineapple-snake. It receives its Latin name, which signifies "the silent rattlesnake," because of the ten or twelve rows of horny scales that are present upon the tip and under surface of the tail, for these, although unsegmented and incapable of producing sound, are of a similar nature to the horny growths that constitute the rattle of a rattlesnake.

The Bushmaster is of a very fierce disposition, and, unlike the majority of snakes, makes no attempt to escape when disturbed. Its venom is extremely active, and as much as three hundred and fifty milligrammes have been extracted at a time from a single individual—a quantity that is double the amount yielded by the largest rattlesnake.

"Unrivalled in his display of every colour of the rainbow," writes Charles Waterton, the snake "glides undaunted on, sole monarch of the forest. Both man and beast fly before him, and allow him to pursue an undisputed path."

Very few specimens of the Bushmaster have ever been seen in this country, and it is impossible to keep them alive in captivity for long as they invariably refuse to feed.

Closely allied to the foregoing is the Fer-de-Lance, Rat-tailed Serpent, or Jaracara, as it is variously called, which is found in Central and South America, as well as in St. Lucia and Martinique. It grows to a length of as much as eight feet, and abounds in coffee and sugar plantations, where it resorts for the purpose of capturing and feeding upon the rats that frequent such districts in considerable numbers. It is a very dangerous species, and in the Island of Martinique one hundred people are reported to be killed every year from the bite of the reptile.

Of the African venomous snakes, the Puff-adder is responsible for causing annually a great number of deaths among the population. It is a repulsive-looking creature with a large, flattened, triangular-shaped head, and a very thick body. Occasionally growing to a length of five feet, the reptile inhabits dry and sandy districts, and spends much of its time hidden beneath the surface of the soil with only its head exposed to view. When alarmed or irritated, it causes its body to swell out with air, and then slowly expels the same from its lungs, thereby producing a loud hissing sound. Its venom is of such a virulent nature that horses have been known to die within a few hours after being bitten by one of the reptiles; while Mr.

Lydekker tells us that "the poison is used by the bushmen for their arrows, to the tips of which it is made to adhere by being mingled with the viscid juice of the amaryllis."

Other members of the present group are the Gaboon Viper and the Rhinoceros or Nose-horned Viper, both of which are found in East and West Africa. Like the Puff-adder, they have large and flattened heads, but their bodies are decorated with bold and brightly-coloured designs that render them more pleasing objects to gaze upon. Although by no means common in captivity, specimens have been exhibited at the London Zoological Gardens on several occasions, and not long since one of the former arrived there that was the largest individual ever known, for it measured five feet in length, and weighed twelve pounds.

The Rhinoceros Viper receives its name from the curious fleshy-growths that arise from the summit of its snout. It is of a sluggish disposition and, unless actually trodden upon, rarely takes any notice of human beings, even should they pass within striking distance of its lurking place.

The Long-nosed Viper, found in Southern Austria, Hungary, and the Balkan States, and the Cerastes or Horned Viper of the Sahara and North Africa, are other examples of snakes endowed with projecting appendages upon their heads ; that of the former consisting of a single upstanding prominence on the tip of the snout, while in the case of the latter a pair of small horn-like growths arise close to the eyes. In olden days it was believed that the horns of the Cerastes Viper were made use of by the reptile as a lure for the capture of its prey, and Pliny writes : "It moves its little horns, often four in number, to attract birds, the rest of the body being concealed." As a matter of fact it does not possess four horns, but only two. Faked individuals, however, are sometimes exhibited by the natives who add an additional pair of horns to the normal complement by deftly inserting some small spines of a porcupine or hedgehog beneath the reptile's skin ; while harmless snakes of quite a different kind are sometimes manipulated in this manner and passed off as horned vipers.

Leaving our remarks upon the highly poisonous sea-snakes to a subsequent chapter, we will conclude our survey of the venomous snakes by introducing to the reader's notice the Kraits, of which there are a number of different species found in South-East Asia—the Blue Krait and the Banded Krait being the most familiar examples.

The former, which is comparatively small and never exceeds four feet in length, receives its name from the prevailing bluish-black colour of its body ; while the latter, which is considerably larger, is conspicuously marked with alternate black and lemon-yellow bands, for which reason it is called by the natives *Sankni*, meaning " a wearer of bracelets."

The Blue Krait is stated to be a very dangerous species, more especially as it frequently makes its headquarters in human habitations ; but the Banded Krait in spite of its power to inflict a poisonous bite, is of such a lethargic disposition that it rarely exercises its powers in such respect, and more frequently than otherwise will submit to be trodden upon by a person rather than get out of his way or attack him. When disturbed, it has the curious habit of hiding its head beneath its coils in a manner that is suggestive of the story of the ostrich hiding its head beneath the sand,—a fact that the writer was able to verify when he was attempting to photograph one of these reptiles at the London Zoo, for no amount of persuasion would induce the creature to offer more than a partial view of that part of its anatomy.

CHAPTER III

THE CONSTRICTING SNAKES

AMONG the constricting snakes are to be numbered the largest of all serpents, for some of the pythons attain a length of from twenty-five to thirty feet, while the anaconda or water-boa is believed to measure occasionally as much as thirty-five feet.

They kill their prey by crushing it to death with their coils, and as the bodies of some of the larger individuals may have a girth equal to that of a man s thigh, it will be realized that the reptiles are capable of exerting a terrific amount of pressure upon a victim. In spite of popular belief, however, these snakes do not break the bones of their prey during the process of constriction, but merely squeeze an unfortunate captive in order to prevent it from expanding its lungs, and to cause suffocation.

The largest of the pythons is the Reticulated Python, or *Ular-sawa* of the Malays. It is found in Burma, Indo-China, and the Malay

Peninsula and Archipelago, and receives its name from the reticulated or net-like pattern that decorates its body ; various shades of yellow, black and brown forming the principal colour scheme, although when the sunlight plays upon the reptile's scales these reflect iridescent hues of indescribable beauty.

The food of this snake consists mainly of various kinds of mammals and birds, the larger individuals being very partial to a diet of wild-pig. Several instances have been recorded of native children being seized and swallowed by pythons, but adult human beings do not appear to figure in their menu. Nevertheless, a snake measuring but twenty feet in length could easily crush a man to death, and if the victim were of slender proportions and not too broad across the shoulders the reptile could even swallow him.

The Reticulated Python thrives well in captivity, but, unlike some snakes, rarely becomes tame. Not infrequently newly-caught individuals refuse to eat, and forcible feeding has to be resorted to in order to keep them alive.

Mr. Ditmars, Curator of Reptiles at the New York Zoological Park, gives a graphic description of the feeding of a hunger-striker under his charge. The method he employed was to prepare a sort of sausage composed of several skinned rabbits, the hind legs of one being fastened with string around the neck of another. When the repast had been thus prepared a number of men grasped the reptile and held it out as straight as possible ; after which the dinner was forced down the snake's mouth, and, with the aid of a long bamboo rod, pushed in the direction it should go for a distance of about five feet. "Several of our big pythons," writes Mr. Ditmars, "have been fed in this manner for a period of about a year. All were brought to a state of perfect nourishment and commenced feeding voluntarily."

These snakes are usually of a somewhat lethargic disposition in captivity, and move about their cages in a very leisurely manner ; but when securing their food they exhibit the most remarkable agility. Throwing their heads forward with a rapidity that the eye can scarcely follow, the reptiles fix their recurved teeth into the flesh of a victim, and immediately envelop it with their coils. When once an unfortunate captive is within the grasp of one of these serpents, it has no chance of escape, and the utmost it can do is to inflict some severe bites. But this only induces the python to exert more pressure or to throw an additional coil around the creature, the death of which generally ensues within a minute from the time when it was first seized.

A large python will make a meal of a small deer or goat without much difficulty, for, as already explained, its jawbones come apart so as to allow the food to pass into its mouth.

On one occasion an individual at the London Zoological Gardens dislocated its jaws as the result of swallowing a kid, and this mishap necessitated the attendance of a veterinary surgeon who was called in to operate upon the patient. The snake was held securely by a number of keepers while the surgeon placed the bones into their proper position, after which the greater part of the reptile's head was enveloped in a thick coating of plaster-of-paris, and bound up with a long strip of lint. This treatment eventually proved successful, although the operation had to be repeated a second time, for on the first occasion the snake managed to rub off the dressings that had been applied.

Another large constricting snake is the Indian or Black-tailed Python which inhabits Southern India, China, the Malay Peninsula, and Java. Known by the natives as the *Adjigar*, the reptile can be distinguished from the Reticulated Python by the large, dark-coloured, javelinshaped mark upon the top of its head, and also by its comparatively thicker body and smaller head. It does not attain such a length as the latter snake, and the largest individuals do not measure more than twenty-five feet. It feeds chiefly upon mammals and birds, but, according to Mr. Mole, is very fond of the enormous teju or teguexin lizards, and has even been known to swallow a four-foot alligator.

In the Rock Python and the Royal Python we come to two well-known examples of the present group that are found in Africa. The former, which comes from Tropical and Southern Africa, and occasionally grows to a length of twenty-three feet, is regarded with veneration by the natives, who build Fetish houses or temples wherein the reptiles are allowed to roam at will. Should they wander beyond the precincts of their prescribed domain, their guardians and slaves coax them back again ; bowing before them and kissing the ground as a mark of respect.

The Royal Python of West Africa, also known as the Ball Snake because of its habit of coiling itself up into a compact mass, is a much smaller species than the foregoing and rarely exceeds six feet in length, although individuals of double that size have occasionally been found.

It is reported that the natives of certain parts of the Guinea Coast worship this reptile and erect special temples where the creatures can resort and obtain the attentions that their sanctity entitles them to receive. The species is much better tempered than other pythons, and even newly-caught specimens rarely attempt to bite.

Brief mention must be made of the handsome Diamond Python which inhabits Australia and New Guinea. The largest of the Australian snakes, and attaining a length of eight feet, the reptile receives its name because of the small yellow spot that decorates the centre of each of its scales. A variety of this species, which differs from the typical race in regard to its colouring and marking, is known as the Carpet Python.

The young of all pythons are produced from eggs, of which from fifty to one hundred are laid by the female at a time.

She collects them into a conical heap, and then coils her body around them so as to keep them warm, and after an interval of about two months the baby snakes hatch out. Pythons have bred in captivity on several occasions, and not long since an individual at the London Zoo laid a number of eggs and endeavoured to incubate them. Her efforts, however, did not meet with success, for the eggs eventually became addled and had to be removed.

Passing to the boas, of which there are seven species, we find that they differ from the pythons in several particulars, the most important feature being that whereas the latter produce their young from eggs that are laid by the female, those of the former are brought forth alive.

The largest of the group is the Anaconda or Water-boa of South America, but as we shall be dealing with this at some length in the chapter devoted to aquatic snakes, we will proceed to introduce the reader to the well-known Boa Constrictor of the West Indies and Tropical America.

It has frequently been recorded that this snake attains a length of from thirty to sixty feet · while in ancient days even larger individuals were supposed to have existed, as can be judged by the following quotation taken from an old Dictionary of Natural History : " If we go back to the period when Rome was a great city, we shall read of one that had its lair on the shores of the Bagradus, and that measured one hundred and twenty feet in length. All the weapons the army of Regulus was able to bring against the monster were of no avail, and it was not slain until it had destroyed several battalions, and the siege-guns, loaded with ponderous stones, were levelled against it."

The capacity of the reptile for swallowing large creatures has also been much exaggerated, and in another Natural History book of early date we find a description of a fight between an enormous Boa Constrictor and a buffalo that the former managed to kill and swallow. "Having darted upon the affrightened beast," so the story goes, "it instantly began to wrap him round with his voluminous twistings; and at every twist the bones of the buffalo were heard to crack almost as loud as the report of a gun."

In M. Gironiere's book, *Twenty Years in the Philippines*, the following statement (quoted by Mr. Frank Buckland in his famous work, the *Curiosities of Natural History*) appears:

"A criminal hid from justice in a cavern; his father, who alone knew of his hiding place, went sometimes to see him and take him rice. One day he found, instead of his son, an enormous boa asleep. He killed it and found his son's body in its stomach. The priest of the village who went to give the body Christian burial, and who saw the remains of the body, described it . . . as of almost incredible size. Many other similar facts were told me by Indians. They told me of men who, whilst passing through the forest, had been seized by a boa, crushed against a tree, and afterwards devoured."

As a Boa Constrictor seldom exceeds twelve or fourteen feet in length, the monsters that have just been described can only have existed in the minds of the narrators, whose imagination was more highly developed than their gift for veracity.

Boa Constrictors will become very tame in captivity and do not resent being handled. On several occasions at the London Zoological Gardens one of these snakes has involuntarily swallowed another owing to the fact that both had commenced to feed upon the same object. An individual nine feet in length made a meal of a companion that was but a foot shorter than itself, and another one, eleven feet in length, swallowed a nine-foot specimen. Needless to say, after a meal of such generous proportions the diner's body is so distended that it looks as if it were about to burst.

The flesh of the Boa Constrictor is eaten by some of the natives in Eastern South America, and they also utilize its fat as an ointment for the treatment of various diseases. Mr. Buckland tells us that he once ate a portion of the flesh of one of these snakes that had been accidentally killed. "I tried the experiment," he writes, "and cooked a bit of him: it tasted . . . like veal, the flesh being exceedingly white and firm. If I had had nothing else, and could have forgotten what I was eating, I could easily have made a dinner of it."

CHAPTER IV

BURROWING SNAKES

ONE would hardly expect to find snakes dwelling underground, but there are several kinds that spend the greater part of their time beneath the soil, and only occasionally come to the surface during wet weather.

Apart from their peculiar habits, these snakes differ from the typical forms in many respects. Their heads, for instance, merge into their worm-like bodies without any constriction at the neck ; while their smooth scales are very small and of almost equal size all over the body, instead of, as in the case of most snakes, being larger upon the ventral surface of the reptiles. The mouth, which is situated on the underside of the head, is also very small, and the jaws can only be separated to a very limited extent ; but as the creatures feed entirely upon earth-worms, ants, and the larvæ of various kinds of insects, there is no need for them to open their mouths very wide when swallowing such prey.

Among the various kinds of burrowing snakes are to be numbered the so-called blind-snakes, which are represented by two families known respectively as the *Typhlopidæ* and the *Glauconiidæ*. In spite of their name, however, they are not blind, although their eyes are merely of a rudimentary nature, and each one is covered with a transparent, horn-like sheath.

Blind-snakes are small worm-like reptiles that rarely exceed six inches in length. They are but poorly provided with teeth, for in the first-mentioned group they are absent in the lower jaw, while in the latter this peculiarity is reversed.

Found in every part of the Tropics, they burrow in the ground like a worm, and force their way through the soil with the aid of their heads which are armed with horny sheaths.

Their smooth and burnished scales offer little resistance to their passage, and also serve to protect them from the bite of those insects whose larvæ they feed upon.

Very curious is the West African burrowing-snake (*Calabaria*), which is the sole representative of its genus. It grows to a larger size than the above-mentioned blind-snakes and occasionally measures as much as three feet in length ; while its cylindrical body is of a peculiar purplish-brown colour, mottled with yellowish spots.

During the daytime the reptile conceals itself beneath the ground, but at dusk it comes to the surface to search for its prey, which consists of small rodents—the unfortunate victims frequently being taken from the burrows wherein they are sheltering.

Southern India and Ceylon is the home of a group of snakes called shield-tails, because of the curious blunt-ended nature of their tails, which terminate in a rough and flattened disc, and look as if the extremity had been cut off.

Why they should be truncated in this peculiar manner is not known, but it has been suggested that the blunt-ended surface is pressed against the ground when the reptiles are burrowing, and acts as a lever for thrusting themselves forwards. The snakes spend nearly all of their time underground searching for earth-worms, upon which they exclusively feed, and only occasionally do they leave their subterranean home during the rainy season. Mr. Lydekker tells us that they are often dug up in tea and coffee plantations, and are sometimes found hidden under logs and stones.

Other burrowers are the cylinder-snakes, of which the red-snake, found in the Malay region, may be taken as a typical example. It receives its name from the scarlet hue of the under surface of its tail; grows to a length of about thirty inches; and feeds upon small birds, mammals, and insects. It is stated that the natives frequently make a pet of this snake, and even employ it as a personal ornament by wearing it around their necks.

Another species of the present group is the coral cylinder-snake of Tropical South America. It is marked with alternate rings of red and black, and thus exhibits the same colouring as the non-burrowing and highly-venomous coral-snake found in the same region, but belonging to quite a different family.

This remarkable similarity between the two is an interesting example of the phenomenon called *mimicry*, whereby a harmless creature receives the benefit of a certain degree of immunity from attack because of its resemblance to another one that is dangerous or in some way harmful.

There are a number of snakes that inhabit sandy districts and hide themselves beneath the surface of the soil. Of these, the eryx or sand-snakes, found in South-East Europe, North and East Africa, and Southern and Central Asia, are represented by seven species, all of which are characterized by the small size of their eyes and stumpy nature of their tails. The largest kind is the Indian eryx, which frequently measures three feet in length. The reptile is quite harmless and a great favourite with the Indian snake-charmers who exhibit it as a two-headed snake—the second head being the creature's blunt-ended tail, which has previously been artificially endowed with a mouth and a pair of eyes—and tell their audience that while one end is slumbering the other keeps awake.

The sand-frequenting Hog-nosed Snakes of North America are an interesting group, for their snouts terminate in a strong, upturned, shovel-shaped, and projecting shield that assists the reptiles when they are burrowing.

Although perfectly harmless, when disturbed or cornered they will engage in a little game of bluff and endeavour to impose upon or intimidate a would-be captor by assuming the pose of a deadly cobra—raising their heads into the air, and expanding the skin-folds of their necks into the form of a hood.

Should this method of deception not prove successful in saving them from molestation, they still have another artifice to employ. Dropping its head to the ground, an individual will commence to writhe about in a manner that suggests it were in its death throes ; its contortions gradually getting feebler and feebler until, with a final spasm, it turns over on to its back and remains motionless.

Those who are unaware of the snake's artful ways would naturally come to the conclusion that the creature was dead, for even when picked up it shows no signs of life, and remains hanging limp in one's hand. But should the captor walk away for a short distance and wait quietly for a few minutes, the snake quickly *comes to life again* and makes the most of its opportunity to escape.

The Hog-nosed Snake, which Catesby describes as having " a visage terrible and ugly," is also known as the Spread-head, the Spreading-adder, the Puffing-adder, and the Blowing-viper ; while a certain species found in Virginia is called the Calico Snake because of its bright colouring —the name " calico " being that by which the Americans describe brightly-coloured cotton prints that are used for making into dresses.

CHAPTER V

AQUATIC SNAKES

ALTHOUGH practically all snakes are able to swim, there are certain kinds that exhibit a marked partiality towards water and spend much, or all, of their time in that element.

The largest of these aquatic snakes is the Anaconda or Water-boa which is found in Brazil, Peru, and the Guianas. As in the case of the Boa-constrictor, many exaggerated accounts have been given in regard to its size and swallowing capacity.

Hartwig tells us that the " Hideous Reptile will engulf a horse and its rider, or a whole ox as far as its horns," while the Spaniards of the Oroonoque, who state that the snake attains a length of as much as eighty feet, call it by the name of *Matatoro*, meaning " bull-killer."

As a matter of fact, the Anaconda rarely exceeds thirty feet in length, but a well-known naturalist considers that much larger individuals may exist, " as it is very improbable that the largest specimens have ever come under European observation."

With the exception of the sea-snakes, the Anaconda is the most aquatic of all serpents. It loves to lie almost completely submerged beneath the water, with only its head exposed to view, while at other times it may be seen floating upon the surface and drifting down stream. Sometimes it will repose upon the branches of a tree, in which position it will remain on the look out for any unfortunate creature, such as a peccary (a species of wild-pig), that may happen to come within its reach; but as a rule it feeds upon birds, although an individual has been known to swallow a crocodile. Instances have also been recorded of these snakes attacking a man, and the natives hold them in great dread.

The Anaconda, which is a constricting snake and kills its prey by crushing it to death within its coils, is easily distinguished by the large, oval, and blackish spots that decorate its olive-green coloured body. Specimens are occasionally to be seen at the London Zoological Gardens, and in September, 1913, a female at that institution gave birth to four young ones, a photograph of which appears in these pages. Each of these babies measured nearly three feet in length, weighed about a pound, and exhibited similar markings to its parents.

Passing over numerous species of smaller aquatic snakes that call for no special comment, we come to the curious Wart Snake, or Elephant-trunk snake, as it is often called, because of the fanciful resemblance of its somewhat flattened, thick, and greyish-coloured body to the proboscis of an elephant.

Seldom leaving the water, this ugly reptile is very fond of taking up its residence in ditches and canals, but sometimes it will frequent brackish water, and has occasionally been known to swim out to sea for a considerable distance from land.

Found in the Malay Peninsula, Java, and New Guinea, the natives of Siam utilize its skin in the manufacture of their drums.

Aquatic and semi-aquatic snakes are to be found amongst the vipers, one of the most venomous being the beautiful Copper-head, which is responsible for causing more deaths to man than the Rattle-snake.

A highly poisonous group of serpents are the Sea Snakes, of which a number of different species are to be found in the salt and brackish waters of the tropical parts of the Indian and Pacific Oceans.

Dr. Theodore Cantor, who made numerous experiments in order to test the virulence of their venom, found that a fowl would die in eight minutes after being bitten by one of these reptiles ; while fish succumbed in ten minutes, a tortoise in twenty-eight minutes, and a non-venomous snake was paralysed after an interval of half an hour. Sir Joseph Fayrer also mentions the case of a fisherman who died in an hour and a half after receiving a bite.

They are of a savage disposition, and when removed from the water will bite furiously at any object that may be within their reach. In their rage they will even seize hold of and lacerate their own flesh with their teeth.

Varying in length from two to ten feet, although even larger individuals have occasionally been reported, these snakes are well adapted for a purely aquatic life. Their tails are flattened like the blade of an oar, and in some species are of a prehensile nature, so that the reptiles can anchor themselves to sea-weed or other objects ; while their nostrils, which open upwards and are situated on the top of the head, are provided with valves that can be closed when the creatures are diving beneath the water. Although able to remain submerged for a considerable period, they must come to the surface from time to time in order to obtain a fresh supply of air, for, unlike the fish which extract the air that is dissolved in the water through the agency of their gills, the snakes breathe by means of lungs.

The eyes of Sea-snakes are small, and the circular pupils become very much contracted when the reptiles are out of the water. If exposed to bright sunshine, the creatures are stated to become dazzled or even blinded by the unaccustomed glare, but they sometimes go to sleep while floating upon the surface of the sea.

In the majority of Sea-snakes the scales upon the under-surface of their bodies are of a rudimentary nature, or may be absent ; but those species that are in the habit of occasionally leaving the water are provided with abdominal scales which enable the reptiles to progress overland in a similar manner to the purely terrestrial snakes. The skin, which is shed much more frequently than in the case of other snakes, is never cast entire, but comes off in pieces.

Sea-snakes are often brightly coloured in various shades of yellow or olive-green, decorated with black bands and spots.

They feed upon fish and crustaceans which are killed by their poison before being eaten. All are viviparous, the females giving birth to their young ones in some sheltered rock-pool, and guarding them during the early stages of their existence by coiling their bodies around them.

Sea-snakes have never been seen alive in this country, but they have been exhibited on two occasions in the United States.* The first example was procured many years ago by the late P. T. Barnum, the well-known American showman, and this lived for about six months ; while in the early part of the year 1924 the authorities of the New York Aquarium obtained a specimen of the Yellow-banded Sea-snake that lived for two months.

Our review of aquatic snakes would hardly be complete without reference to the Great Sea Serpent.

According to ancient Norse mythology a gigantic serpent surrounded the world, but we find that the size of this fabulous creature became gradually smaller in the descriptions of the writers of later date, and its mythological character entirely disappeared in the accounts given by Olaus Magnus and Bishop Pontoppidan, in the sixteenth century.

The latter gives a very entertaining description of the Sea-serpent or Kraken in his *Natural History of Norway*.

---

* Since writing the above, a pair have arrived at the Aquarium at the London Zoo.

"The Norwegian fishermen," he writes, "unanimously affirm, and without the least variation in their accounts, that when they row out several miles to sea, and . . . expect to find eighty or one hundred fathoms of water, it often happens that they do not find above twenty or thirty, and sometimes less. At these places they generally find the greatest number of fish, especially cod and ling. Their lines, they say, are no sooner out than they may draw them up with their hooks full of fish ; by this they judge that the Kraken is at the bottom. They say the creature causes these unnatural shallows, mentioned above, and prevents their sounding."

The description of this monster is given as follows :

"Its back, or upper part, which seems to be, in appearance, about an English mile and a half in circumference—some say more, but I choose the least for greater certainty—looks at first like a number of small islands, surrounded with something that floats and fluctuates like sea-weed. Here and there a large rising is observed, like sand-banks, on which various small fishes are seen continually leaping about, until they roll off into the water from the side of it. At last several bright points, or horns, appear, which grow thicker and thicker the higher and higher they rise above the surface of the water ; and sometimes they stand up as high and large as the mast of a middle-sized vessel. It seems these are the creature's arms, and it is said that if they were to lay hold of the largest man-of-war they would pull it down to the bottom."

Bishop Pontoppidan describes another Sea-serpent, six hundred feet in length, which was seen off the coast of Norway in the year 1740 ; while the Norwegian missionary, Hans Egede, also gives an account of a gigantic Sea-serpent which reared itself out of the water in a most alarming manner.

Many other instances could be given concerning Sea-serpents of more recent date, and it would be possible to fill many pages with descriptions of such monsters ; but we will confine our further remarks upon such happenings by mentioning a large and unknown species of marine animal that was seen off Sicily by the officers and crew of the royal yacht *Osborne*, on June 3rd, 1877—an official report of which was forwarded to the Admiralty.

The captain of the vessel, who observed the creature through his telescope, said it possessed an enormous head and large flippers ; while one of his lieutenants was able to distinguish above the surface of the water a row of fins which extended for a distance of about thirty feet, and varied in height from five to six feet. Another observer stated that the creature's head was from fifteen to twenty feet in length, and that the portion of its body not submerged beneath the sea was not less than forty or fifty feet long ; while the engineer described the animal as possessing an uneven ridge of fin-like growths that projected above the water to a height of between seven and eight feet, and extended for forty feet along the surface.

Nobody knows what this strange animal was, and it yet remains to be proved that the so-called Great Sea-serpent really does exist.

Some people do not hesitate to deny that there is such a creature, and suggest that a flight of sea-fowl, a row of porpoises, some basking-sharks, or even a long trailing mass of sea-weed may have been mistaken for some huge and unknown marine animal ; but, on the other hand, others are by no means so sceptical, and Mr. P. H. Goose, in his well-known book, *Romance of Natural History*, states : " I express my own confident persuasion there exists some oceanic animal of immense proportions which has not yet been received into the category of scientific zoology. . . ."

Mr. A. D. Bartlett, for many years Superintendent at the London Zoological Gardens, also gives his opinion in regard to this debatable question in the following words: "When we consider the vast extent of the ocean, its great depth, the rocky, cavernous nature of the bottom . . . who can say what may be hidden for ages, and may still remain a mystery for generations yet to come; for we have evidence on land that there exists some of the largest mammals, probably by thousands, of which only one solitary individual has been caught or brought to notice. May I not therefore presume that in the vast and mighty ocean, animals, perhaps of nocturnal habits . . . may exist, whose form may resemble the extinct reptiles whose fossil remains we find in such abundance. As far as I am able to judge from the evidence before me, I have reason to believe that aquatic reptiles of vast size have been seen and described by those persons who have endeavoured to explain what they have witnessed."

It may be of interest to mention that the solitary animal alluded to in the above statement by Mr. Bartlett was the Hairy-eared Rhinoceros, a single individual of which was captured at Chittagong in 1868, and was subsequently exhibited at the London Zoo, where it lived for a number of years.

The comparatively recent discovery of a large zebra-like animal (now known as the Okapi) in the dense forests of the Belgian Congo is another circumstance that lends additional support to the belief that large and hitherto unknown animals may exist.

CHAPTER VI

TREE SNAKES

IN the present chapter we propose to deal with certain snakes that are to a greater or lesser extent arboreal in habits, many of them frequenting the highest branches of trees and rarely descending to the ground, while others are mainly bush-dwellers.

South and East Asia is the home of some arboreal species called Whip-snakes (*Dryophis*), because of the extreme slenderness of their bodies. Of the eight different kinds that are known, the Green Whip-snake may be taken as a typical example.

Some authorities state that it is of a gentle disposition, while others describe it as being extremely ferocious, but we have good reason to know that it can exhibit both these qualities in rapid succession.

Being desirous of taking a photograph of an individual that was exhibited for sale at an animal dealer's establishment, the writer, after careful enquiries as to the character of the reptile, and being assured that it was quite tame, received permission to proceed with his work. Unfastening the glass-fronted door of its cage, he took hold of the snake and, carrying it to an adjoining courtyard, placed it upon the branches of a small tree that was growing in a tub. So far the reptile had upheld its reputation, and that of its owner, by behaving in a most exemplary manner, but no sooner was it liberated than it asssumed the most alarming attitude—opening wide its mouth and facing the photographer, no matter which way he turned.

Although this action on the snake's part enabled the writer to obtain several good pictures, when once his plates had been exposed, the question arose as to how he was to return the creature to its cage. All attempts to approach and seize it from behind were of no avail, and the gaping jaws of the reptile did not invite a frontal attack ; but the problem was eventually solved with the aid of a stick, by means of which the snake was removed from the branches and carried dangling therefrom to its original quarters.

The natives call this reptile the Eye-poking Snake, because, as they say, it darts its sharp-pointed head at the eyes of a person who disturbs it ; and judging by the behaviour of the individual we have just described, we can well believe that their statement is quite true.

The American snakes of the genus *Zamensis* are also known as whip-snakes because of their extremely slender bodies and the manner in which they lash out with their tails when disturbed, but they also receive the name of "Racers," owing to the remarkable rapidity of their movements.

One of the best-known species is the Black Racer, which grows to a length of seven feet. It is by no means a pleasant creature to come across, for not only will it attack a person who should happen to pass within its reach, but it will even descend from the upper branches of the trees in order to do so.

Lawson gives a very amusing account of this reptile, from which we take the following extract: "He is the best Mouser that can be, for he leaves not one of that vermin where he comes. He also kills the Rattlesnake wherever he meets him by twisting his head about the neck of the Rattlesnake and whipping him to Death with his Tail. This Whipster, for all his Agility, is so brittle that when he is pursued, and gets his Head into the Hole of a Tree, if anybody gets hold of the other End he will twist and break himself in the Middle."

One would hardly expect a snake to indulge in the practice of gliding through the air, but in the Flying Snake of Southern India and other parts of Tropical Asia we have an example that will leap from one tree to another in a very remarkable manner. During its " flights " the reptile holds its body out quite straight and contracts the under part so as to present a concave surface to the air ; and by this means it is able to skim along for a short distance in an oblique and downward direction. Major Flower reports having seen one of these snakes launch itself from an upper window of a house and land upon a branch of a tree eight feet away.

The Flying Snake is a handsome-looking creature, and, although somewhat variable in colour, is usually dark-green, decorated with yellow, red, or orange spots. Its head, however, is black, marked with yellow bars and spots.

Other well-known snakes of arboreal habits to which we would draw attention are the Chicken Snake, the Summer Snake, and the Annulated Snake. The latter, which comes from the West Indies and Tropical South America, often reaches this country as a stowaway amidst a bunch of bananas, and not infrequently some of the enormous bird-eating spiders are also found hidden amidst the fruit. Although the reptile spends most of its time in the trees, it will come to the ground in search of its prey, which consists exclusively of frogs and fish.

The Chicken Snake is a North American species that receives its name because of its propensity for stealing fowls from the poultry-runs; while the Summer Snake, from the eastern part of the United States, is of special interest owing to its habit of feeding upon such fare as caterpillars, spiders, grasshoppers, and beetles.

Among the venomous snakes we have examples of tree-frequenting species in the Boomslang, the Green Mamba, and Kirkland's Tree-snake. The first-mentioned, which grows to a length of five feet or more, comes from Tropical and Southern Asia.

At one time it was regarded as a quite harmless reptile, and those kept at the London Zoological Gardens used to be handled with impunity by the keepers; but it is now known to be poisonous, and, notwithstanding the small size of its fangs, its venom is sufficiently powerful in its action to kill small animals in a very short time. That a bite from one of these reptiles will also prove dangerous to man was made manifest a few years back when a victim was bitten in the arm. After a short interval, symptoms of a serious nature developed, and the condition of the patient became worse and worse until, on the third day after receiving the wound, the doctor in attendance held out little hope for his recovery. Happily, however, the sufferer managed to pull through, but it took three months before he was completely restored to health.

When excited, the Boomslang expands its neck into a globular-shaped swelling, a habit that is also indulged in by the above-mentioned Kirkland's Tree-snake. The latter reptile, although endowed with poison-fangs, is not regarded as a dangerous species, for notwithstanding the threatening attitude it will assume, it seldom attempts to bite a person who disturbs it. Resembling the Whip-snakes in regard to its elongated and slender proportions, this snake is very inconspicuous in its haunts, for the pinkish-brown colour of its body and tail, and bright green head, renders it almost invisible amidst the twigs and leaves.

In the Green Mamba we have a very venomous snake found in Tropical and Southern Africa. It attains a length of ten feet, and is so greatly feared by the natives on account of its fierce disposition that they refrain from visiting a locality where one of these reptiles is known to be lurking.

Curiously enough, however, they also appear to regard it with a certain degree of veneration, and believe that were they to kill one their god would be offended by their act.

Unlike the majority of snakes, which slink away when disturbed, the Mamba does not hesitate to attack a person who approaches its domain, but even chases him with a speed that augurs ill of its intentions. As the bite of the reptile proves fatal in a few hours, the best thing to do on such an occasion is to run away from the creature ; and although such a proceeding may not be of a very dignified nature, it is as well to remember the old adage that " discretion is the better part of valour."

The last, but by no means the least remarkable, of the tree-haunting snakes that we propose to mention is the Egg-eating Snake (*Dasypeltis*) that is found in Southern and Tropical Africa. It is a quite small and insignificant-looking creature, and rarely measures more than two feet in length ; but in its anatomical structure it presents the unique feature of possessing what may well be called " throat-teeth," which are enamel-tipped and downward-projecting processes arising from the lower surface of the backbone in the region of the neck, and piercing the underlying muscles so that the points are exposed within the gullet of the snake.

The reptile feeds entirely upon birds' eggs, and, as its teeth are very minute, few in number, and of a rudimentary nature, is able to swallow them without breaking their shells.

When an egg passes down into the gullet, it comes into contact with the " throat-teeth," and by pressing these against the egg, the snake is able to split the shell lengthways and thus liberate the contents. The yolk then journeys in the direction that Nature intended it should go, but the shell is ejected from the snake's mouth in the form of a pellet.

As a rule the reptile contents itself with feeding upon the eggs of nesting birds which it finds amidst the branches of the trees, but when these are difficult to procure in sufficient numbers, and a farm-yard happens to be near at hand, it does not hesitate to pay a visit to the fowl-houses in order to sample a new-laid egg.

Although the dimensions of such fare would be many times that of the snake's head, the reptile swallows its dinner without much difficulty. The proceeding, which may be compared to a person swallowing a football, cannot be of a very pleasant nature, however, for until the egg reaches the " throat-teeth " and is broken thereby, the snake's neck is distended to such an extent that it looks as if it were about to burst.

Punch comments upon the reptile's curious habit of breaking the eggs it eats when they are already half-way down its throat, and states, "Snakes have more faith than we have."

CHAPTER VII

BRITISH SNAKES

THE writer was once paying a visit to a museum at a well-known seaside resort when he came across a show-case devoted to the display of reptiles. For the benefit of those visitors who might be interested in the exhibit, a printed notice informed them that there were three different kinds of British snakes, namely, the Grass or Ringed Snake, the Viper or Adder, and the Slow-Worm. Unfortunately, however, the information imparted was like the curate's egg, inasmuch as it was only good in parts, for although it is quite true that there are three species of snakes found in the British Isles, the Slow-Worm is not one of these as it happens to be a legless lizard. But if the name of the Smooth Snake had been substituted for that of the latter creature, all would have been in order, and many hundreds of people might have acquired some useful information that would help to eradicate the old-established belief that the Slow-Worm is a snake.

The Ringed or Grass Snake is the commonest of the snakes found in this country, but its range also extends to the Continent, Algeria, and West and Central Asia. It is found in considerable numbers in the South of England, but in the North is comparatively rare, while in Scotland and Ireland it is absent. British specimens rarely exceed three feet in length, but individuals of more than twice that size have been recorded elsewhere. The colour of the reptile is somewhat variable and ranges from brown to grey or olive-green. As a rule a bright-yellow or orange-tinted collar-like marking is present upon the nape of the neck, and behind and on either side of this is a black triangular-shaped patch. In some individuals the collar extends right across the back of the neck, but in Continental specimens it is often divided in the middle, or may even be absent.

The Grass Snake usually shelters amidst long grass or thick undergrowth in the vicinity of water, and spends much of its time basking in the sunshine. It takes readily to the water and swims rapidly with its head and neck held well above the surface. Frogs, toads, and fish form its chief food supply, but it will also eat voles, mice, small birds and their eggs, and lizards. The unfortunate victims are swallowed alive, and sometimes a frog may be heard to croak after it has disappeared down the snake's interior. An instance has also been recorded of a frog that managed to regain its liberty after a snake has swallowed it by jumping out of the mouth of the reptile when the latter was indulging in a prodigious yawn.

The female Grass Snake, which is larger than the male, lays her eggs during the months of June, July, and August. From ten to as many as fifty may be laid at a time, and as each one is enveloped in a glutinous secretion, they stick together and form a mass. As a rule they are deposited in a manure heap or in the midst of decaying vegetation, where they are left to hatch by the heat generated therefrom—the incubating period being about six weeks. The young ones are provided with a small prominence or " egg-tooth " upon the end of their snouts, and this, which is shed two days after the snakes are born, assists them to break out of the egg.

There is a very old belief, dating back to the days of the Druids long before the Christian era, that the egg of a Grass Snake worn as an amulet would bring benefit to the wearer ; while the Zulu witch-doctors are said to make use of various kinds of snakes' eggs in a similar manner. Few of us, however, would care to eat them, but Mr. Buckland gives an amusing account of a little girl who actually did make a meal of some.

"Some years back," he writes, "I obtained several eggs . . . and put them on a shelf of a greenhouse to see if the heat of the sun would hatch them. One morning I found several of my eggs gone; everybody denied touching them. At the same time a certain young lady, then an inmate of the nursery, was suddenly taken ill. The doctor was sent for, but was puzzled to ascertain the cause of the illness. At last the confession reluctantly came out from the sobbing culprit that she had eaten some large sugar-plums she had found on a shelf in the greenhouse. She had, in fact, made a repast of the snake's eggs, under the delusion that she was robbing the cook of preserves put out to dry."

Grass Snakes hibernate during the winter months, and large numbers may often be found during that season coiled up together in a manure heap, under hedges, or in some hole beneath the roots of a tree. They soon become quite tame in captivity, but newly-caught individuals will hiss loudly and struggle to escape. They rarely bite, however, but, as previously mentioned, when handled will emit a very unpleasant odour.

The Viper or Adder is found over the greater part of Europe, but, as in the case of the Grass Snake, is absent from Ireland. It is the only venomous reptile found in the British Isles, and can usually be distinguished by the conspicuous and dark-coloured zig-zag pattern that extends along the upper part of its body and tail. In some individuals, however, the markings are very indistinct, while in Continental specimens they may be absent.

Although rarely exceeding twenty inches in length, it has been known to attain a measurement of twenty-eight inches.

Many curious beliefs are held in regard to this snake.

Some of the village folk in Devonshire affirm that if one of the reptiles bites a cow, its shape, complete in every detail, will be represented in the cream obtained from the cow on the next occasion when it is milked ; while many people are under the impression that a mortally-injured snake never dies until sunset.

Mr. P. M. Duncan tells us that " the ancients had a notion that the young vipers killed their mother in coming into the world, and hence one or more of these parricidal reptiles were placed in a bag with a human parricide and drowned as the punishment of this greatest of crimes."

In *Pepys' Diary* the following curious passage occurs which presumably refers to the Adder: "Mr. Templer, an ingenious Man, discoursing of the Nature of Serpents, told us that some in the waste Places of Lincolnshire do grow to a Great Bigness, and do feed upon Larkes which they take thus.—They observe when a Larke is soared to the Highest, and do crawl till they come just underneath them, and there they place themselves with their mouth uppermost; and there, as it is conceived, they do eject Poyson upon the bird; for the Bird do suddenly come down again in its course of a Circle, and falls directly into the Mouth of the Snake."

Although the bite of an adder rarely proves fatal to a healthy person, it gives rise to very alarming and painful symptoms. A man who was bitten on the thumb gives a very vivid account of his experience. He tells us that the flesh around the wound became livid in a very short time, and his hand and arm then began to swell. After an interval of about a quarter of an hour he was incapable of holding anything, and his tongue became so swollen that he could hardly move it. His eyes felt as if they would burst out of their sockets, and violent pains attacked his heart and stomach, accompanied by vomiting. For two days his arm continued to swell, until it was almost the size of his leg ; and although the swelling gradually subsided, it took twelve days before the limb regained its normal dimensions.

Mr. Curtis, writing to the *Field*, records the following case of a man who was bitten by an adder. He states : " When walking on a country road I saw coming towards me a labouring man riding a cart-horse, and his attitude struck me as strange. He drew up and asked me the way to the nearest doctor, and said he had been bitten by an adder. He looked so seriously ill that I followed him in and entered the surgery. He was then insensible and sitting in a chair. His head was so swollen that neither eye could be seen, and his breathing was noisy and painful to hear—the doctor cupped him, and gave him stimulants, and then laid him on the floor. He told me he did not know whether he was dead or alive. He recovered after a long period of unconsciousness, but was ill for some time. He had been looking over potatoes in a clamp, and an adder had darted from the straw covering and bitten him in the temple."

Domestic animals, such as dogs, sheep, cows, and pigs sometimes get bitten by adders, and some time back a curious incident was reported in the Press, of a cow, owned by a farmer in the north of Scotland, that died as the result of swallowing one of these reptiles.

In former days the venom of the adder was often employed for medicinal purposes, and Dr. Meade (quoted by Buckland), writing in 1745, complained that the physicians at that time "deal too cautiously and sparingly with a remedy which may be applied to very good purposes, when they prescribe a few grains of the powder of dried vipers, or make up a small quantity of their flesh into troches (lozenges)." He continues his remarks by saying that "the patient ought to eat frequently of viper jelly or broth; or rather, as the ancient custom was, to boil vipers and eat them like fish. If this food will not go down (though really very good and delicious fare), to make use at least of wine in which dried vipers have been digested for two or three days in a gentle heat, from which I have seen very good effects in obstinate lepra (a skin disease); or lastly, where wine is not convenient, to take either the powder, or good quantities of viperine salt, in which alone the virtue of all medicines made from this creature resides."

The cast skin of the adder, wrapped round the head of a person, was also considered to be an effective cure for headache ; while the fat of the reptile was employed as an ointment for the healing of cuts and burns.

It has for long been a common belief that female vipers swallow their young ones when they are in danger, and although the majority of naturalists at the present day do not regard the accomplishment of such a feat as in any way probable, the question is one that is continually cropping up, and there still remain many people who are unconvinced that such is not the case.

There is no disputing the fact that such believers are able to produce a great deal of published evidence in support of their claim, and that the evidence comes from widely different sources and dates back to very ancient times.

From very early days the North American Indians have believed that the vipers found in their country offered a temporary refuge to their young in their throats ; while we find further reference to this supposed habit in Spenser's

Faerie Queene, published in 1590, in which the following lines appear:

> "*Soon as that uncouth light upon them shone,*
> *Into her mouth they crept, and suddaine all were gone.*"

Miss Catherine C. Hopley, who has collected a vast amount of information bearing upon this subject, quotes (in her book entitled *Snakes*) the words of many people who support the theory that young vipers do take refuge in their mother's bodies.

Châteaubriand, she tells us, states that "by a singular faculty the female can introduce into her body the little monsters to which she has given birth"; while Dr. Edwardes Crispe, F.Z.S., lecturing in 1862 at a meeting of the Zoological Society, told his audience he had "positive evidence enabling him to state with certainty that the English viper and some other venomous snakes do swallow their young at an early period." In 1865 a contribution appeared in the pages of *Science Gossip* from a correspondent, who not only declared he had seen a viper swallow her young, but even went so far as to emphasize his remarks by stating that "by the way the mother opened her mouth to receive them . . . they were accustomed to that sort of thing."

Many other records could be mentioned in support of this debatable question, but we will conclude our remarks thereon by quoting from a cutting taken from a magazine of comparatively recent date, the name of which the present writer regrets he is unable to give owing to his having omitted to make a note of the same.

" For positive evidence on the subject," the correspondent states, " we have only to turn to a report furnished by Dr. Brown Goode to the American Association for the Advancement of Science, in which he details the replies received by him from more than eighty observers in twenty-four different States and Provinces of the United States, in answer to a circular letter which he had sent out asking for information. Seventy-seven witnesses saw the young snakes enter the parent's mouth ; twenty-two of these heard the young called by a hiss or sound of rattle ; five waited and saw the young re-appear, and one of them seeing the act repeated several times ; three saw young ones issue from the old one's mouth, and thirty-six of those who saw the young enter the mouth found them there on killing the parent. These observations related to nine different species of snakes, the English and scientific names of which are given. It seems inconceivable that sixty-seven independent witnesses could have all been mistaken."

Although it cannot be denied that this evidence is difficult to refute, yet it is just as difficult to believe. Unless a good many of the observers were expert naturalists it is somewhat strange they were able to give such a detailed description of the reptiles they saw, so that no less than nine different species were recognized by the reports they sent in ; while, moreover, there is every reason to believe that those snakes actually found within their parents' bodies were merely the unborn broods that had not seen the light of day.

We still await conclusive evidence that snakes in this or any other country do swallow their young with a view to giving them a refuge, and it is of interest to note that a substantial reward of money offered some years back by the proprietors of the *Field* for such evidence was never claimed.

The Smooth Snake is found over the greater part of Europe, but its range in the British Isles is restricted to the counties of Surrey, Hampshire and Dorsetshire. It attains a length of about two feet, and receives its name from the smooth and unkeeled nature of the scales upon its back, in which respect it differs from both the Grass Snake and the Adder ; while another feature by which it may be recognized is that the pupil of the eye is circular instead of taking the form of a vertical slit.

The female lays from three to twelve eggs at the end of August or the beginning of September, and the young ones therein are then so well developed that they almost immediately break out of the shell and commence a free existence.

CHAPTER VIII

ENEMIES OF SNAKES

SNAKES have many enemies to contend against, for not only do they suffer from the hostility displayed towards them by mankind, but they are preyed upon by various kinds of mammals and birds. They also fall victims to the appetite of their own kindred, and even the diminutive ants have been known to kill and devour these reptiles.

Hedgehogs will attack and eat snakes, and the species found in this country is regarded as the chief enemy of the venomous adder. It has often been stated that these beasts are more or less immune against snake-poison, but many authorities are inclined to doubt the truth of this assertion in view of the fact that the creatures act so cautiously when approaching their prey, and take care never to expose a vulnerable portion of their anatomy.

When a hedgehog meets a snake that it wishes to make a meal of, it waits its opportunity, and, rushing towards its victim, gives it a sharp nip with its teeth, after which it retires as quickly as it advanced, and tucks its head beneath its body. Should the reptile retaliate against the treatment it has received, it has the painful satisfaction of biting upon an array of sharp spines; and as soon as it has withdrawn to contemplate upon the rashness of its behaviour, the hedgehog lifts its head, gets in another bite, and retires once more—this method of procedure being repeated until the reptile is killed.

The Armadillos, found in Central and Southern America, will also eat snakes. They are well protected against the bite of such reptiles, for the top of their heads is covered with a shield composed of bony plates embedded in the skin; while the upper-part and sides of their bodies are encased in a cuirass of a similar structure, the middle portion of which is divided into a varying number of transverse and movable bands.

Although Armadillos rely upon their teeth for killing their prey, a curious incident has been reported of an individual that was seen to employ the sharp edge of its body-armour as a weapon for the purpose of sawing and lacerating the body of its victim.

It is, however, among the Mongooses that we must look for the most expert of mammalian snake-killers, for they are much more agile, and of a far more ferocious disposition, than those creatures we have so far mentioned. As in the case of the Hedgehog, it is a common belief that Mongooses are immune against the effects of snake poison. Experiments, however, have proved that such is not the case (although they are probably less susceptible than the majority of animals), for if an individual gets badly bitten by a venomous snake, it has little chance of recovering from the effects of the poison.

As a matter of fact a Mongoose rarely does get bitten, for it is so active in its movements that it can usually manage to dodge a snake in the act of striking ; while, moreover, even should the reptile reach its mark, it finds it a difficult matter to thrust its fangs into the flesh of its antagonist because of the harsh and wiry nature of its long coat, and the thickness of its skin.

At one time it was a common belief that the Indian Mongoose would eat a certain herb (known by the natives as *manguswail*) whenever it happened to receive a bite ; but this story is not based upon fact.

Many accounts have been given of fights between one of these animals and a Cobra, and all agree that the beast carries out its attack in a very cautious manner. Keeping at a respectful distance, the Mongoose runs round and round the snake, which, with head erect and hood expanded, is compelled to turn first one way and then the other in order to face its enemy.

These tactics are continued until the reptile becomes so bewildered and exhausted that it eventually drops to the ground in order to rest ; whereupon the Mongoose will make a sudden pounce upon the unfortunate creature and crush its head with its teeth.

The African Marsh-Mongoose deals with the deadly Puff-adder in a similar manner to that we have described, but as this reptile does not poise its head and neck in the air as a preliminary to striking, the beast varies the performance by occasionally leaping over its victim.

Of the numerous species of Mongooses, the Egyptian species, or Ichneumon, as it is frequently called, is of special interest, for the ancient Egyptians regarded it as sacred because of the service it rendered to them by eating the eggs of crocodiles and thereby putting a check upon the multiplication of such reptiles. Its image, moreover, was often depicted on old Egyptian frescoes, and it is recorded by Herodotus that the bodies of defunct individuals were often buried in " holy repositories."

African snakes have another formidable enemy in the Zorilla or Cape Polecat, a small creature, with long black and white fur, about the size of a rabbit. It will not hesitate to attack the venomous Cobra and Puff-adder, and when dealing with such prey displays a very fierce disposition. In captivity, however, it becomes quite tame, and the Boers, who call it by the name of *Musihond*, meaning "mouse-hound," frequently keep them in their houses for the purpose of catching mice and rats.

Wild pigs will eat snakes, and it is quite likely that their domestic brethren would have no objection to partake of such fare if it were offered to them. It has also been said that domestic goats will sometimes feed upon these reptiles; while the wild species known as the Markhoor (a name meaning "snake-eater") is also supposed to have a liking for such dainties. The truth of such statements, however, is, to say the least, open to doubt.

There are quite a number of birds that regard snakes as tasty morsels to feed upon; the Secretary-Bird, or Secretary-Vulture as it is often called, being the most familiar example.

Standing about four feet in height, and possessing very long legs, it receives its name from the crest of plumes that arise from the back of its head and look something like a bunch of quill-pens.

Although not immune against the effect of snake-poison, the bird has little to fear when attacking a venomous snake, for its long legs, which are the only part of its person within convenient reach of the reptile, are protected by horny scales, and these are so hard that the snake's fangs are unable to penetrate them. Nevertheless, the Secretary Bird does not run any risks during an encounter with a venomous serpent, but guards its body by holding out its wings in front of itself so as to form a protective shield. It employs its legs as weapons, stamping upon a victim and gripping it with its claws.

Owing to the snake-killing habits of this bird, it is protected by law; and it is by no means an uncommon sight to see tame individuals roaming about the homesteads of the African farmers.

Australia is the home of the Laughing Jackass, or Laughing Kingfisher, which will feed upon snakes (more especially upon young ones), although its principal food consists of small mammals, frogs, lizards, spiders, and beetles. The bird is also known in its native country as "Johnny," or the "Settler's-Clock," the latter name being given to it because of the regularity in which it gives utterance to its curious laugh-like cry. Like the Secretary Bird, it receives the protection of the law because of the benefits it renders to mankind.

Some of the storks include snakes as an item of their diet. The American Wood-storks, which congregate in large flocks, feed chiefly upon fish and water-snakes, which they procure by wading into the water and stirring up the mud with their feet, whereupon the unsuspecting victims come to the surface to investigate the cause of their disturbance, and are promptly killed by the birds as the result of their inquisitiveness. Audubon describes this procedure and states that "in the course of ten or fifteen minutes hundreds of fishes, young alligators, and water-snakes, cover the surface, and the birds greedily swallow them until they are completely gorged, after which they walk to the nearest margins, place themselves in long rows, with their breasts all turned to the sun, in the manner of pelicans and vultures, and there remain for an hour or so."

The Ground Hornbills are other birds known to feed upon snakes; while remains of these reptiles have been found in the stomach of the Bittern.

In our opening chapter we referred to the fact that certain snakes fed upon their kindred, but we now propose to deal with the subject in more detail.

The North American King-snake is one of those addicted to the habit of dining upon other species, but as it does not discriminate between the venomous and non-venomous kinds, its liking for such fare proves very beneficial to mankind.

Rattlesnakes, the Copperhead, and the Moccasins, all fall victims to its appetite, and even should these reptiles show their objection to being eaten alive by inflicting a bite upon their assailant, the latter is in no way inconvenienced thereby. Curiously enough, however, although the King-snake is immune against the poison of the American snakes, it will succumb to the effects of a bite delivered by poisonous snakes found in other countries.

The King Cobra is another devourer of snakes, and includes in its menu the venomous Banded Krait ; but as the latter also has cannibalistic tendencies, it has little cause to complain at being subjected to such treatment.

The Black Kribo, the Coral-snake, and the African Yellow-cobra, are other well-known examples of snake-eating species.

The question has often been raised as to whether a snake can kill itself with its own venom, or whether an individual will die if it be bitten by one of a similar species.

Sir Joseph Fayrer, who experimented upon Indian snakes, found that the poisonous species were wholly or partially immune against their own venom or against that of another snake found in that country. The harmless kinds, however, would die from the bite inflicted by a poisonous species.

On the other hand, Mr. FitzSimons tells us that if an African Yellow-cobra be injected with some of its own venom it will ultimately die; but the Ringhals snake (closely allied to the foregoing) can be treated in a similar manner with impunity, and the reptile is also said to be immune against the venom of the Puff-adder.

If, however, one of the latter snakes be bitten by an individual of its own species the result is liable to prove very unpleasant for the victim, as may be judged by the following incident (recorded by Mr. Coulson, of Bristol) that appears in the appendix to Mr. Buckland's *Curiosities of Natural History*.

"Our Puff-adders at the Zoological Gardens," he writes, "were fed this day week. They both at the same time made a dart at the same bird, and in so doing one slightly touched the other in the back of the head ; in two minutes he was rolling most awfully about his den—and the others ran off like mad.

"The keeper tells me he lay as if dead after a short time, yet he is still alive, but paralysed ; his head is almost at right angles, turned to one side where the bite was made : he cannot straighten it, and the moment he is touched, he becomes much enraged."

Although it may appear somewhat strange to include ants under our heading of "Enemies of Snakes," yet the African species, known as Driving Ants, are fully entitled to rank as such.

When a swarm of them are on the march, all other living creatures must make room for them to pass or perish because of their refusal to do so, for nothing will turn the ants from their path unless it be fire or water. They congregate in such numbers that their lines sometimes extend for a distance of nearly a mile ; and we are told that when they are walking over dried leaves they produce a noise that has been likened unto the "swish of a scythe."

Although we do not wish to give the impression that the Driver Ants habitually attack and feed upon snakes, we have the authority of Mr. Louis P. Bowler that they have been known to do so.

On one occasion he witnessed a fight between a Horned Viper, or Cerastes Viper as it is also called, and a swarm of ants. The latter were crawling all over the body of the snake, and hanging on with the aid of their sharp mandibles. For a quarter of an hour he watched the reptile writhing about in the midst of a dense mass of ants, but its struggles were of no avail, and it was unable to free itself of its tormentors.

Gradually it became weaker and weaker, until, at last, it lay motionless upon the ground. "In a very few minutes," to quote the narrator's own words, "its body was covered two inches deep with ants tearing and cutting away its flesh."

Several of the lizards will kill and eat snakes, the Australian Stump-tailed Lizard and the so-called Glass-snake being familiar examples.

CHAPTER IX

LAND TORTOISES

THAT "familiarity breeds contempt" is well exemplified in the case of the tortoises, for we have become so accustomed to their appearance, and even to keeping some of the small ones as pets, that we are apt to regard them as commonplace. If, however, we were to see one for the first time, we should probably regard it with astonishment; for a creature that may truly be said to have the greater part of its skeleton outside its body is certainly one of the marvels of animal life.

Those who have studied the evolution of the tortoise tell us that at one time the creature was endowed with a fleshy covering and an outer layer of skin studded with small bony knobs. Those upon the back became more and more developed, and eventually fused into one another and formed a hard shield; while the underlying muscles gradually wasted away, thereby causing the shield to descend until it was arrested by touching the projecting processes of the backbone. As these spine-like growths were then of no further use for the purpose of supporting muscles no longer in existence, they became smaller and smaller in each subsequent generation of tortoises, and ultimately vanished altogether, with the result that the back-shield or carapace dropped still more and rested upon the ribs. Finally, the shell and ribs merged into one another, leaving only the heads and extremities of the latter as evidence of their previous existence.

The lower shell or plastron was evolved in a somewhat similar manner, but was formed by the fusing together of the breast-bone and the bony plates of the under surface of the body.

The proof of this assertion may be gleaned from the evidence offered in the structure of the existing Leathery Turtle, the upper shell or carapace of which is composed of numerous small discs of bone that are not fused together but merely interlock with one another, and are covered with a leathery skin. Beneath this shield there is a layer of muscles covering the back-bone and a set of well-developed ribs which are in no way attached to the outer shell. If we were to dissect one of these reptiles, it would be possible to lift the shell without exposing the internal organs of the creature, but this could not be done in the case of any other of the chelonians, as the tortoises, terrapins, and turtles are collectively called.

Another peculiarity to be noted in the skeletal structure of these creatures is that the shoulder-blades and hip-bones of the adults lie beneath the shell and inside the body-cavity; but in young individuals these bones are situated outside of and beyond the extremities of the shell, and are only gradually enclosed as the bony armour extends in a forward and backward direction during growth.

The box-like covering of a tortoise does not allow the creature to indulge in very violent exercise, and all it can do is to toddle along in a somewhat laborious and ungainly manner. The only part of its vertebral column or backbone capable of movement is the portion embodied in the neck and tail. It has no teeth, but the jaws are edged with horn, which in some species is of a serrated nature. The rather large eyes are provided with eyelids and a nictitating membrane, and the iris is circular.

Land tortoises are able to retract their heads, limbs, and tails within their shells, while in some species a section of either the carapace or plastron is hinged so that the creatures can shut themselves up as in a box.

As chelonians do not possess movable ribs, they cannot breathe as we do by drawing in and expelling air into our lungs by the alternate expansion and contraction of our ribs, aided by our chest muscles, but do so by filling their mouths with air drawn through their nostrils, which open at the back of the palate—the hyoid bone at the base of the tongue being depressed at the same time. The tongue is then raised so as to close the internal aperture of the nostrils, and forces the air down the wind-pipe into the lungs—the hyoid bone having been elevated in the meanwhile so as to allow a free passage.

A tortoise can be suffocated by keeping its mouth open for a long time, or by closing the nostrils and only leaving the mouth free to admit air ; but in other respects it exhibits a remarkable degree of vitality, for it can go without food for months on end, and individuals have been known to move about after being decapitated, or with their brains removed. We are also told that the heart of a turtle will beat for two or three days " after the rest of the animal has been made into soup."

Tortoises hibernate during the winter months in temperate zones, and those of us in this country who have kept them in our gardens as pets know that they will bury themselves under the ground when the weather becomes cold. But as they do not always burrow to a sufficient depth to enable them to withstand a very severe winter, and there is also the risk of them being injured when the gardener is digging, it is better to bring them indoors and let them pass their winter sleep packed in a box and surrounded with straw or hay. It is not necessary, however, to follow the example of a certain person known to the writer who packed up a tortoise in a box and then fastened down the lid with French nails, for the creatures will remain where they are placed until the warmth of the spring sunshine awakens them to activity.

It may here be as well to warn the householder against the wiles of the hawker who endeavours to sell a tortoise to a prospective customer by stating that it will rid a kitchen of beetles, or a garden of slugs ; for although it is true the flat-shelled water-terrapins or pond-tortoises are carnivorous in diet, the land-tortoises that are the kind usually offered for sale feed exclusively upon vegetable substances.

The larger individuals can eat such coarse fare as cabbage-leaves, but the smaller individuals should be given lettuce. If, however, they have the run of the garden they will help themselves to whatever they may fancy, but as they do not realize that pansy blooms and plants of choicer kinds are bedded out for decorative purposes, and not for their benefit, it is as well to keep them within bounds.

Many people are under the impression that tortoises are unintelligent creatures, but such is by no means the case. When kept in captivity they soon learn to recognize those with whom they come into contact, and will readily feed from one's hand.

They usually have several favourite hiding-places in the garden, to which they invariably resort, and when taking their exercise they seem to follow more or less definite routes, thereby suggesting they possess what the phrenologists would call the bump of locality and direction.

One individual the writer possessed was very fond of resting in the middle of a clump of Japanese sunflowers, but as the weight of its body damaged and broke down the stems, an endeavour was made to break it of this habit. Time after time it was removed from the forbidden spot and *put in the corner* in disgrace at the other end of the garden, but after a lapse of a very few minutes it would turn round and stump back to the original place.

Of the three kinds of land-tortoises found in Europe, namely, the Iberian Tortoise, the Grecian

Tortoise, and the Margined Tortoise, the first-mentioned is probably the most familiar, for large numbers of them are imported every year into this country.

It rarely exceeds nine inches in length, and can be distinguished from the others by the large, cone-shaped, horny-covered, and bony tubercle that is present upon the back of either thigh. Found in many regions of Europe, as well as in parts of Asia and Africa, it lives to a great age, and there is a record of an individual that was kept by a family in Cornwall for ninety-six years.

The following account of this animal, published some time back in the *Field*, was given by Miss D. Jenkins. She states: "My uncle, who is now over ninety years of age, says the tortoise has been the same size since he remembered it. It generally buries itself in October and comes out in March. Its tongue is nearly black when it comes out, and for three or four weeks after, when it gets a nice red colour, and then starts eating; its staple food is dandelions, though it will eat asparagus, young peas, gooseberries, strawberries, lettuce, etc., and occasionally drinks for minutes at a time. It is high on the legs, and very lively in hot weather, and pursues the gardener with such determination, biting his trousers and butting at his feet, that he cannot get on with his work, until he has shut it up in a house. From the few scattered fragments which have been handed down to us of its history, it seems to have been brought from the West Indies by the Falmouth Packet by one of the sailors, who gave it to an ancestor of ours."

The Grecian Tortoise is very similar to the foregoing species, but lacks the tubercle upon the thigh. Its flesh forms an article of diet in Greece, and the brains of the reptile, pickled in vinegar, are regarded as a very dainty dish. But in order to obtain this delicacy it is necessary to cut off the tortoise's head, and as the creature shows its objection to being handled by strangers by withdrawing that part of its anatomy within its shell, the operation is not so easy to accomplish as one might imagine. Experts at this procedure however, tell us that the best method to pursue is to tickle the tortoise at the tail end, whereupon it pushes out its head, and can then be decapitated ; but the Zouaves are said to resort to the cruel practice of placing a piece of red-hot coal upon the creature's back in order to induce it to thrust out its neck.

When keeping this tortoise in captivity it is best to have a pair, for a solitary individual is apt to get restless in the spring time, and to roam beyond the precincts of the garden in order to search for a mate. The two sexes may be distinguished from one another by the shape of their plastrons or under-shell, that of the males being slightly concave, while that of the females is flat. During the mating season the males become very pugnacious and butt into one another with their shells, while they will also utter a curious cough-like cry.

The third of the European species, namely the Margined Tortoise, is only found in Greece and Sardinia. It may be distinguished from the other forms by the more elongated shape of its shell.

The American Box Tortoises are interesting species, for they form a connecting link between the Water-tortoises and the Land-tortoises inasmuch as their hind feet are provided with webs. Moreover, they are not strictly vegetarian in their diet, like the typical land tortoises, but will also eat such items as worms, snails, frogs, and slugs.

They receive their name from the manner in which they can shut themselves up like a box, their lower shell being movable and provided with a transverse hinge. Sometimes, however, captive individuals will get so fat from over-eating that they are unable to accomplish this feat.

The most familiar species of the present group is the Carolina Box Tortoise. Its head, limbs, and shell are decorated with black and yellow markings, but these vary so much in size and distribution in different individuals that it is difficult to come across any two that are exactly alike. As a rule the male has red eyes. It inhabits dry woods, and feeds upon berries, shoots of plants, earth-worms, and insects. Mr. Ditmars tells us that "during the blackberry season the mandibles and front feet of most specimens are much stained with the juices."

The Carolina Box Tortoise is now getting somewhat scarce, so much so, indeed, that not long since a Bill was passed in the State of New York making it an offence to collect and offer the creatures for sale.

The Hinge-back Tortoises or Cinixys of Tropical Africa are other examples of tortoises that are able to shut themselves up in their shells, but in these it is the rear portion of the carapace, and not the plastron, that is movable.

The south-eastern part of the United States is the home of the curious Gopher Tortoises, which spend much of their time in underground burrows they dig in the sandy soil with the aid of their front limbs. These excavations, which may extend for a distance of as much as eighteen feet, and reach a depth of about nine feet, are not utilized by the females as a hiding place for their eggs, for she makes a separate hole in the vicinity for the reception of these.

Another very remarkable species, and one that was only brought to the notice of zoologists in the early part of 1920, is the Soft-shelled Tortoise. It was discovered at Dodima, in the territory formerly known as German East Africa, by Mr. Loveridge, who sent two specimens to the London Zoological Gardens, where they are now living. When young, the reptile possesses a dome-shaped carapace like the typical land-tortoises, but this gradually becomes flatter and flatter as the creature attains maturity; an adult specimen only measuring about two inches in depth and eight inches in length.

As the shell also becomes so soft that it yields easily to the pressure of one's fingers, the tortoise adapts its mode of life to suit its altered condition by hiding between the crevices of rocks. Mr. Loveridge found it very difficult to dislodge the reptiles from their refuges, for they resisted any attempt at removal by inflating themselves with air so that their bodies became wedged between the rocks. Unlike other land-tortoises, the present species is very active and can shuffle along the ground at quite an appreciable pace.

In the Starred or Elegant Tortoise, and the Radiated Tortoise, we come to two species that at once arrest attention because of the beautiful markings upon their shells.

The former, which comes from India and Ceylon, has a very high carapace, while the component parts thereof are indented with narrow, transverse, and concentric grooves. The general colour of the shell is black, but the summit of each raised plate is yellow, and a number of lines of a similar colour extend therefrom to the base. The plastron is also very conspicuously marked with two large yellow stars and other radiating streaks upon a black background.

The female lays her eggs in a hole excavated in the ground, and then covers them up again ; stamping upon the soil with her feet so that the hole is completely filled, and afterwards making the surface quite smooth by raising herself high upon her legs and then dropping down suddenly with a thud.

The Radiated Tortoise, found in Madagascar, is somewhat similar in appearance to the abovementioned species, its black shell being decorated with large yellow spots and radiating streaks. Mr. E. G. Boulenger tells us that the natives are very afraid of the creature and believe it possesses the "evil-eye." For this reason they refrain from touching one, or even its eggs.

A pathetic interest is attached to the Giant Tortoises owing to their impending extinction. At one time they were found in North America, India, and Europe, but now only a few individuals exist, outside Zoological Gardens, in the Galapagos Islands (thirteen in number), off the west coast of America, and in certain other islands situated in the Indian Ocean, north of Madagascar.

In many of the smaller of the Galapagos Islands the creatures have entirely disappeared, but a few still remain in the higher parts of Albemarle Island. These are the largest of the existing species, and their shells have been known to measure along the curve over five and a half feet in length. It is estimated that such individuals would be about four hundred years old.

Darwin gives an interesting account of these Giant Galapagos Tortoises in his famous book, *The Voyage of the Beagle.*

At the time of his visit the animals were very plentiful, especially in the high and damp parts of the islands. Some of the males (which have longer tails than the females) were so heavy that it required the united efforts of six or eight men to lift one of them. On some of the islands where there was no water, and also in the lower and barren parts of others, he observed that the creatures fed chiefly upon the succulent cactuses that grew there ; but those inhabiting the higher and damper regions lived upon leaves of various trees, berries, and lichens. The tortoises would travel long distances in search of water, making well-beaten tracks leading from all directions to where it was to be found. " Near the springs," he writes, " it was a curious spectacle to behold many of these huge creatures, one set eagerly travelling onwards with outstretched necks, and another set returning, after having drunk their fill. When the tortoise arrives at the spring, quite regardless of any spectator, he buries his head in the water above his eyes, and greedily swallows great mouthfuls, at the rate of about ten in a minute."

During their journeys to the springs the tortoises travel at the rate of about four miles a day, and when they have reached their destination they stay three or four days in the vicinity of the water before retracing their steps.

In former days the flesh of these tortoises was greatly esteemed as an item of human food, and it was a common practice for whaling vessels to stop at the various islands, when the sailors would land and bring back large numbers of the living creatures, which they kept on board in readiness to be killed and eaten.

Captain Morrell wrote in 1825: "I have known whale ships to take from six to nine hundred of the smallest of these tortoises on board when leaving the islands for their cruising grounds, thus providing themselves with provisions for six or eight months and securing the men against scurvy."

As this systematic destruction continued year after year, there is little cause to wonder that the numbers of the creatures diminished very rapidly; but their scarcity only increased the desire of Zoological collectors to secure a few more specimens before they entirely vanished from off the face of the earth.

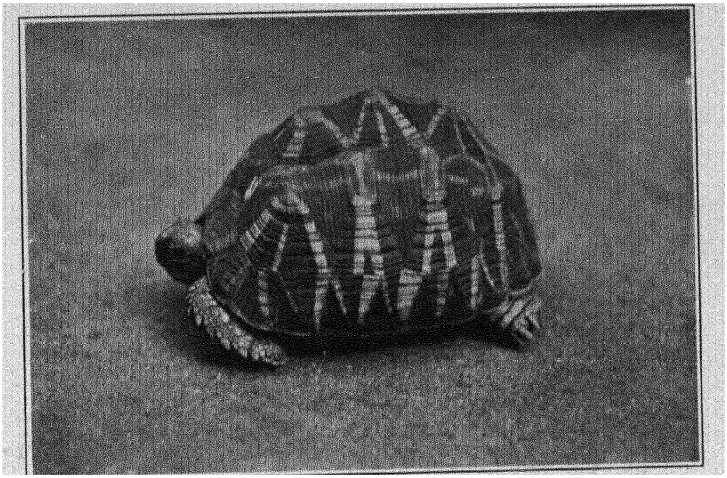
Some years back there was a Galapagos Tortoise exhibited at the London Zoological Gardens with a very interesting history. It came from Kauai, in the Sandwich or Hawaiian Archipelago, and was formerly the property of the Royal family of the Hawaiian Islands for about one hundred years, and in later years belonged to the ex-Queen Liliuokalani. Mr.

R. I. Pocock, late Superintendent of the Zoological Gardens, writing to the *Field* in regard to this reptile, stated: "It was one of the very large numbers of giant tortoises turned loose in the Pacific Isles, particularly in Rotumali, by Capt. David Porter, of the U.S. battleship *Essex*, who was sent to guard the Galapagos Islands in 1813-1814." According to Lord Rothschild, who presented the creature to the Society, it was believed to be the last living representative of its kind.

The Elephantine Tortoise, another of the giant species, has not suffered the same fate as the Galapagos Tortoises; for although it is no longer found in its original home, the North Island of Aldabra, it was introduced into the Seychelles, in the Indian Ocean, where it continues to thrive under Government protection.

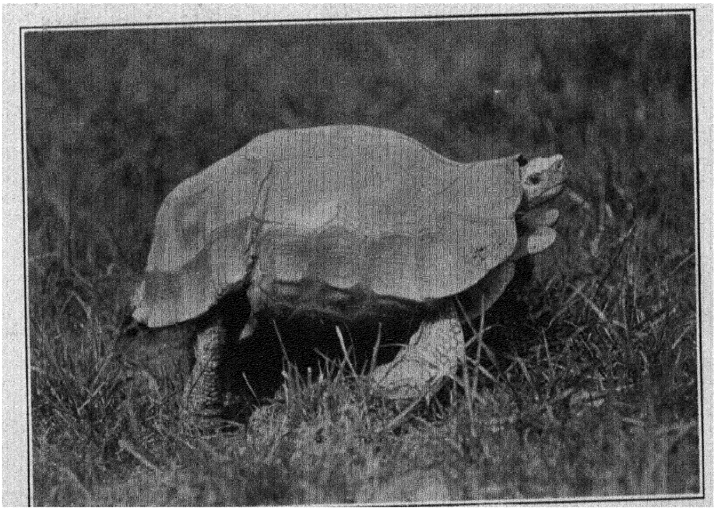
Mr. M. J. Nicoll gives the following interesting account of the giant tortoises he saw during a visit to the Seychelles:

"In the grounds of Government House," he writes, "we saw a large number of Aldabra Tortoises. Some of them were of large size and a great many were newly hatched. We were informed that they bred freely in confinement and that the young grew very quickly. These tortoises are used as food by the natives,



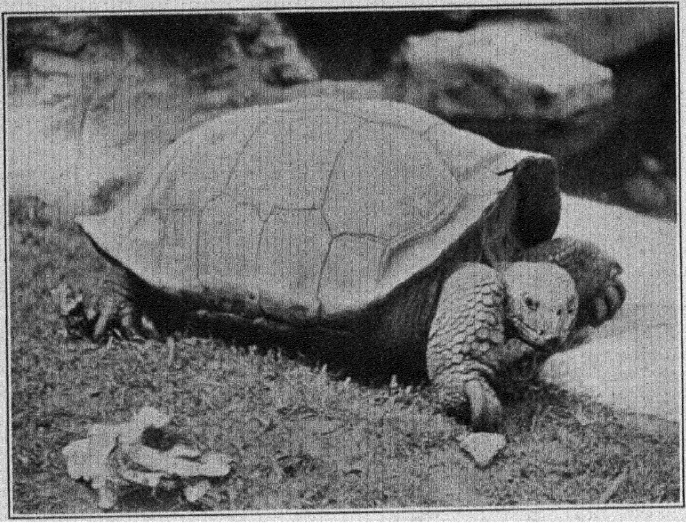
THE STARRED TORTOISE

(See page 136)



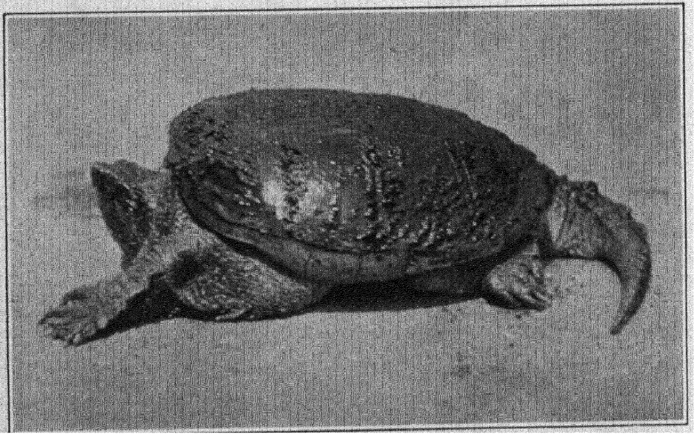
THE HINGE-BACKED TORTOISE

(See page 134)



THE LAST OF ITS RACE, A GALAPAGOS GIANT TORTOISE

(See page 137)



SNAPPING-TURTLE OR ALLIGATOR-TERRAPIN *(See page 146)* and on visiting the market we saw several tethered by the leg and exposed for sale. On all the islands and inhabited islets of this group there were tortoise farms. In nearly all these farms the tortoises bear a number which is painted in white on the shell. Many farm-owners keep a record of all their stock, while at Government House a complete register is made with the dates of hatching and so forth. At the latter place we rode upon the largest tortoise."

CHAPTER X

TERRAPINS AND TURTLES

THERE are a large number of chelonians that lead an aquatic or semi-aquatic life, some of them frequenting fresh water, while others are marine in habits. The group comprises the terrapins and turtles, but these terms are somewhat confusing inasmuch as one writer may refer to a certain species as a " turtle," while another will designate it as a " terrapin." As a rule, however, the former name is restricted to the marine chelonians, and sometimes to the larger fresh-water species, while the smaller aquatic and semi-aquatic kinds are known as terrapins.

The European Pond Terrapin, or Water Tortoise as it is also called, is the best known of the semi-aquatic species, for large numbers of them are imported into this country.

Found in Central and Northern Europe, Asia Minor, and Northern Africa, it can be distinguished from the small land-tortoises one commonly sees by its flat carapace, comparatively longer tail, and more slender limbs, while the feet are webbed and furnished with sharp claws. The plastron or lower shell is divided by a cartilaginous hinge that enables the posterior and anterior lobes to be opened and closed.

Rarely exceeding six inches in length, this terrapin spends much of its time in the water, but it frequently leaves that element and comes on dry land in order to bask in the sunshine.

Its normal diet consists of small fish, frogs, worms, and insects, but those kept in captivity have been known to eat bread and lettuce.

The flesh of many terrapins is eaten by the inhabitants of those countries where the creatures occur, and in the Roman Catholic parts of Germany it used to appear as an item on the menu for "fish days." The Americans regard the Diamond-back Terrapin as a special dainty, the preference probably being given to the species because it is the only one of its kind that frequents brackish and salt waters. Of late years, however, its numbers have become so greatly reduced that there is a danger of the creature becoming extinct at no remote date.

An effort was recently made to popularize the dish in this country, and in the spring of 1924 two hundred terrapins were brought over alive from the United States, in special tanks, by the White Star liner *Olympic*. Sixty of these were served at the Boat Race Gala Dinner held at the Savoy Hotel during that year, and the remainder were taken to Maidstone to form the nucleus of a terrapin farm for the benefit of American visitors or other people who might feel inclined to sup upon such fare at a future date.

Passing to the Mud Terrapins, we come to a group of small species that inhabit muddy rivers and lakes of the United States, Mexico, and Central America. Their lower shells are hinged and movable, and in some of them the legs of the males are provided with specially-developed horny tubercles that are capable of producing a stridulating sound when rubbed against one another.

One of the kinds often seen in this country rejoices in the name of the Blood-stained Mud-terrapin, while another is called the Stink-pot Terrapin or Musk-terrapin, because of the strong and disagreeable musky odour it exudes.

In the Spanish Terrapin (*Clemmys leprosa*) we have a curious species that receives its specific name from the fact that when dwelling in stagnant or insufficiently aerated water, it often becomes infected with a disease which produces gangrenous spots and patches suggesting the marks due to leprosy.

Some of the terrapins are very prettily marked. The Adorned Terrapin, for instance, has orange streaks upon its head and neck, and large spots of a similar colour upon the margin of its shell; while the Painted Terrapin has vermilion-coloured bars and crescents along the edge of its shell, and its head is decorated with yellow, and its neck with yellow and red, stripes.

But to pass from the sublime to the ridiculous, we have only to introduce the reader to the Matamata Terrapin and the Long-necked or Snake-necked Terrapins.

The first mentioned is found in the Guianas and Northern Brazil, where it dwells amidst stagnant pools and swamps. Described by Mr. Ditmars as a creature "more like a vision of a disordered dream than a living reptile," its head, neck, and body is so flat that the animal looks as if it had been passed through a mangle. Its shell, moreover, is very rough and has the appearance of being composed of pieces of rock; but the most peculiar feature it reveals is to be noted in the series of fleshy and worm-like appendages, present upon the chin and neck, which waft about in the water and are believed to act as a lure for attracting the fish upon which the reptile feeds.

As implied by its name, the Long-necked

Terrapin is characterized by the extraordinary length of its neck, which, together with the head, is slightly longer than its shell. Nevertheless it can withdraw its neck within its shell, but when so doing this is bent sideways instead of, as in the case of other kinds of retractile-necked tortoises, in a vertical S-shaped loop ; and for this reason the creature is often called the Side-necked Terrapin.

Other grotesque-looking creatures are the Alligator Terrapins, or Snapping Turtles as they are also called. They have large heads armed with a powerful hooked beak, and a thick, tapering, crested, and scaly tail suggesting that of an alligator.

From the floor of the mouth arise two small worm-like growths, and when the reptiles are reposing motionless upon the bed of a stream with open mouths, these appendages are moved to and fro and act as a lure to attract any fish that may happen to catch sight of them.

The Common Snapping Terrapin, which may be taken as a typical example of the family, is found in Southern Canada, the United States, and Mexico. Frequently weighing as much as twenty pounds, the creature is very destructive to fish and waterfowl—dragging the latter beneath the water, and pulling them to pieces with the combined use of their strong jaws and forefeet. In June or July the female leaves the water in search of a suitable spot where she can deposit her eggs, and having found a situation to her liking she commences to dig in the mud or loose sandy soil until she is almost buried beneath the surface. Here she remains for about a week, and during that time lays from thirty to forty spherical and thin-shelled eggs.

In some districts the flesh of the Alligator Terrapin is used for food, and it is frequently to be seen in the markets of the southern United States.

Very curious are the group of fresh-water chelonians known as Trionyx or Soft-shelled Terrapins. Their bodies are not provided with an external shell, but are covered with skin that looks very much like leather. They have long heads, terminating in a projecting and tubular snout ; their broad feet are webbed ; and their sharp-edged jaws are concealed by thick lips.

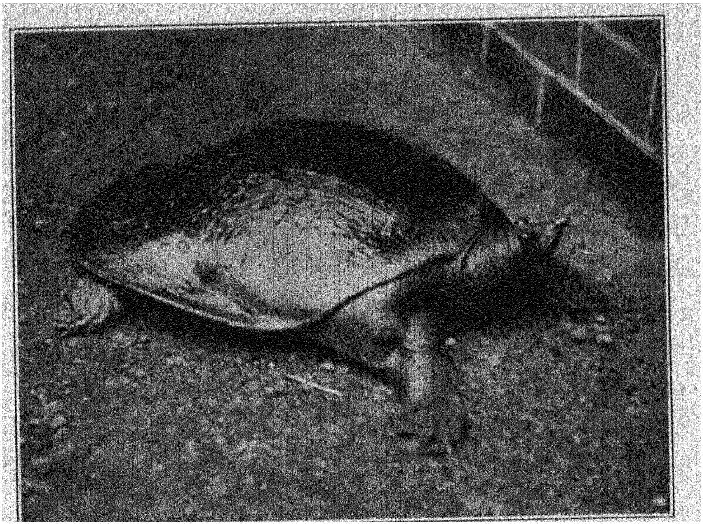
There are fifteen different species of Trionyx, some of which come from North America, one from Africa, and others from Asia. One of the largest is the Ganges Trionyx, the shell of which may measure over two feet in length. It is of a very fierce disposition, and an individual has been known to bite off a man's toe. Its tenacity of life is so great that if one of the creatures be decapitated, its jaws will continue to open and close for quite a long time afterwards. When disturbed it is said to utter a "low, hoarse, croaking noise."

The natives are very fond of its flesh, and capture the creature with the aid of a long iron fork or sharp-pointed stake of bamboo, which they prod into the mud beneath the water where the animals resort.

Theobald, who gives an interesting account of this proceeding in the *Journal of the Linnean Society*, tells us that "if a fork touches a Turtle concealed below, the motion of the animal is felt: a cautious examination is then made with the hand, and a fish-hook is cleverly inserted in the soft part of the tail. A steady haul is now made, and out comes the Turtle, wildly floundering and snapping at everything within its reach with pertinacious fury."

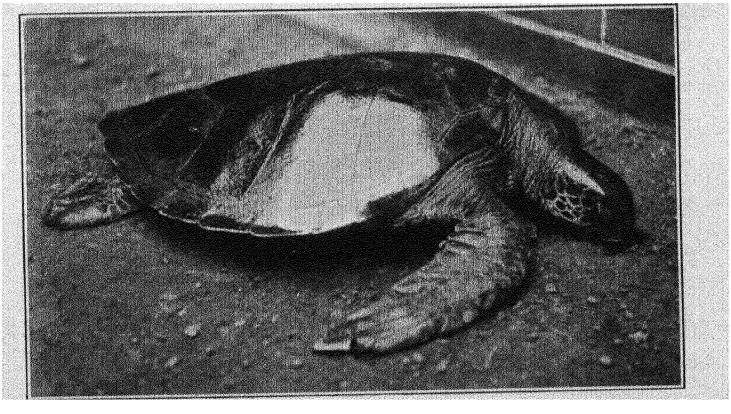
But should a large individual be discovered in deep water, and it is impossible to attach a hook to its tail, a fork is driven through both its upper and lower shell with the aid of a mallet, and the creature is afterwards hauled out of the water.

The sole African representative of this group is known as the Nile Trionyx, but although it in-



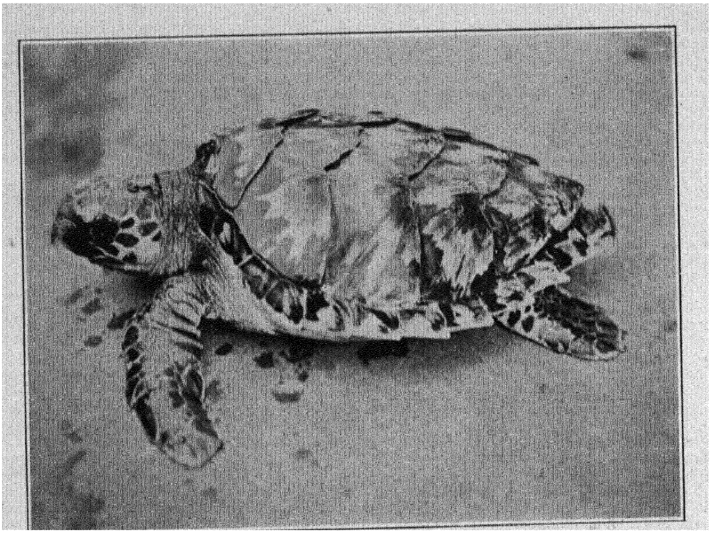
A GANGES TRIONYX
Note the tubular nostrils

(See page 147)



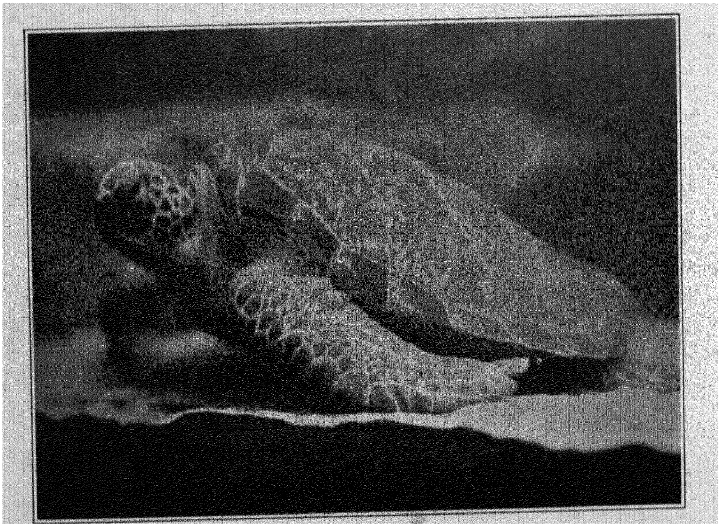
THE GREEN TURTLE OF 'SOUP' FAME

(See page 150)



THE HAWKSBILL TURTLE, THE SPECIES FROM WHICH "TORTOISESHELL" IS OBTAINED

(See page 151)



THE LOGGERHEAD TURTLE

(See page 153)

habits that river from which it receives its name, its range extends as far south as the Congo. It is somewhat larger than the Ganges Trionyx, and a full-grown specimen may have a shell measuring over three feet in length, and attain a weight of as much as thirty pounds.

The Arabs regard it with a certain degree of respect because it is supposed to search for and eat the eggs of crocodiles, but they do not allow their veneration to interfere with their liking for its flesh.

The American Trionyx are smaller than the Old World kinds, and none exceeds eighteen inches in length. Their flesh is greatly esteemed as an item of diet, and the creatures are often displayed for sale in the eastern United States markets.

The negroes capture them with a baited hook and line, and " when several have been procured," to quote the words of Mr. Ditmars, " the heads are chopped off and a small cut made in the soft plastron, for cleaning ; at no part of the process are the outlines of the turtle materially changed. The entire animal is then rolled in meal and placed in a frying-pan. It looks exactly like a big pancake. . . ."

Although the name " turtle " is sometimes applied to certain kinds of fresh-water chelonians, strictly speaking it should only be used to designate those that dwell in the sea.

One of the most familiar of these is the Green Turtle, which receives its name from the green colour of its fat, and has gained considerable notoriety from the "turtle-soup" made from its flesh.

A full-grown individual weighs about four hundred pounds, and has a shell measuring three and a half feet in length. The latter is of a brownish colour marbled with yellow streaks, and although very similar in appearance to the "tortoiseshell" of commerce, is of no value for manufacturing purposes.

The creatures are found in all tropical seas, and are especially abundant off the West Indies, the Bahamas, and Ascension Island. Frequently they are met with in the Atlantic, even at a distance of from seven hundred to eight hundred leagues from land, when they can easily be caught as they sleep floating upon the surface of the water. Most of those that find their way to the market, however, are captured whilst they are visiting the shore during the breeding season—large numbers being turned over upon their backs with the aid of a long pole, after which they are collected and carted away.

The females deposit their eggs in a hole they excavate in the sand to a depth of several feet. These are spherical in shape, and possess a soft and leathery shell, thereby differing from those of the tortoises and terrapins which are hard-shelled.

As many as two hundred eggs may be laid in the hole, and the turtle then covers them up with sand and levels the surface so as to make the hiding place as inconspicuous as possible.

After an interval varying from eighteen to thirty days, the young ones hatch out by the heat of the sun, and immediately make their way to the sea. Many of them, however, do not succeed in reaching their destination, for hawks and different kinds of sea-birds are ready to seize them as they toddle along the beach to the water, and even should they arrive there various species of fish are waiting to greet them with open mouths.

Equally famous as the foregoing is the Hawksbill Turtle, for it is the kind that yields the beautiful product known as "tortoiseshell," which consists of the thin, semi-transparent, and overlapping horny-shields covering the bony carapace.

These shields, which are employed for various decorative purposes, are removed from their bony support by being placed in boiling water or oil, after which they are flattened out by pressure and allowed to cool. As each plate is but of limited size, it is often necessary to join two or more together when a large unbroken surface is required for use. The upper edge of one and the lower edge of another is bevelled so that the two margins fit together, after which the shields are heated and placed in metal presses, thereby causing the overlapping parts to unite. In this manner the shell can be moulded into any desired shape, and even the smallest fragments can be utilized.

At one time it was the practice to suspend living turtles over a fire until the heat caused the plates of shell to come apart from the underlying bone, and the unfortunate victims were then allowed to return to the sea, where they were supposed to grow a new shell. Nowadays, however, this cruel method is no longer adopted, and the creatures are killed by a blow upon the head before their shell is removed.

The Hawksbill Turtle receives its name from the fact that the extremity of the horny cutting-edge of its upper jaw projects downwards like the bill of a hawk. It does not grow so large as the Green Turtle, and rarely exceeds three feet in length. Large numbers of them are killed every year, and a fully-grown individual will yield from five to ten pounds of " tortoiseshell." As a rule the creatures are captured when they come ashore to lay their eggs ; but nets, spears, hook and line, and various forms of traps are also employed for that purpose.

As we have already alluded to the Leathery Turtle or Luth in the previous chapter where a description of its unique characters will be found, we will now introduce the reader to the last of this group of chelonians, namely the Loggerhead Turtle.

Although very similar in appearance to the Green Turtle, there are several features by which the present species may be distinguished therefrom. Its head, for instance, is much larger in comparison to that of the latter, and each of its fore-flippers is provided with two nails. The shell of the carapace, moreover, is divided into five or more plates on either side of the central row, whereas only four pairs of these marginal shields are present in the Green Turtle.

A large Loggerhead may have a shell four feet in length, and weigh five hundred pounds. Its flesh is eaten, but is of very inferior quality to that of the Green Turtle.

CHAPTER XI

CROCODILES AND ALLIGATORS

THE members of the order *Crocodilia* comprise the Crocodiles, the Alligators, the Caimans or Caymans, and the Garials or Gavials. Most of them are of large size, and one species attains a length of nearly thirty feet. Their elongated bodies and tails are covered with thick scales; their legs are short; and their toes are more or less connected by webs. The feet, however, are not employed to any great extent for the purpose of swimming, for the creatures propel themselves through the water chiefly with the aid of their tails, which are moved in lateral undulations.

Crocodiles and their allies are well-adapted for living in the water, for their eyes and nostrils are elevated upon the head in such a manner that the reptiles are able to see and breathe when floating upon the surface without exposing any other part of their bodies.

The eyes are provided with eye-lids and a transparent nictitating membrane, and the orifice of the ears, as well as the external openings of the nostrils, can be opened or closed at will. Posteriorally, the nostrils open at the back of the throat and are separated from the mouth-cavity by specially developed bones and membranes that act as valves. When the latter are shut the animals are able to open their mouths and hold their prey whilst under water without any of the liquid passing down their throats ; and if they wish to take in a fresh supply of air to their lungs, it is only necessary for them to expose and open their nostrils above the surface.

The animals are endowed with a formidable array of teeth, all of which are planted in sockets and are shed at frequent intervals. Each one is hollowed out at its base, and the cavity acts as a protecting sheath for the point of a new tooth that gradually pushes its way forward and replaces the old one.

With the Crocodiles the fourth tooth on either side of the lower jaw fits into a notch in the side of the upper jaw, so that it is always visible whether the animal's mouth be open or shut ; but in the case of the Alligators, and their allies the Caymans, the upper jaw is provided with a small cone-shaped pit that receives and conceals the extremity of the tooth when the mouth is shut. In very old animals, however, these teeth may grow so large as to pierce through the upper jaw and be visible above.

Crocodiles and their kindred are produced from eggs which have a hard, oval, and white shell. The young ones are provided with a small horny prominence or " egg-tooth " situated on the end of their snouts, and this is employed by the embryos for the purpose of cutting through the shell. Being of no further use when once the babies have liberated themselves, it is then shed after an interval of a few days.

Of the twelve different species of crocodiles found in Africa (including Madagascar), Southern Asia, Northern Australia, and America, one of the most interesting is the African or Nile Crocodile, which used to be worshipped by the Ancient Egyptians, who regarded it as the symbol of sunrise. The reptiles were reared in certain cities, and decorated with rings of gold and precious jewels placed in the membranes of their ears which were pierced for that purpose, while their forefeet were encircled with bracelets. After death the bodies of the animals were embalmed and buried in the catacombs.

From the many accounts that have been given of these crocodiles it appears that they were as much pampered as the pet-dogs of modern days, and Herodotus describes the feeding of one individual which was given a portion of roast meat, a cake, and a cup of wine for a meal.

Because of its man-eating habits the Nile Crocodile is very much dreaded by the natives and other people dwelling in those regions where it is found. An instance is recorded of one of these reptiles pulling a man from his horse whilst wading across a stream, and we are also told that a purse containing more than fifty pounds in gold was found in the stomach of an individual that had been killed.

Another specimen when cut open yielded the following assortment of objects : Eleven thick brass arm-rings ; three twisted wire armlets ; a necklace made of glass beads ; a piece of fibre-cord as used by a native for tying up his pack ; fourteen leg and arm-bones of various animals ; three portions of mammalian backbones ; some porcupine quills ; and eighteen stones of various size. This collection was exhibited in March, 1923, at the Scientific meeting of the London Zoological Society by Mr. C. F. M. Swynnerton, Game Warden of the Tanganyika Territory, who actually killed the reptile.

The finding of stones in the stomach of a crocodile is by no means an unusual occurrence, and it appears that they are swallowed for the purpose of assisting the creatures to grind up and digest their food, much in the manner that a fowl eats grit and small pieces of flint.

According to the Arabs, the animal swallows a stone on each anniversary of its birthday, but we should imagine it would sup upon more tender and tasty fare when celebrating such an event.

The strong hide of a crocodile makes a very serviceable leather, and the Ancient Egyptians employed it for their armour.

The flesh of the animal is sometimes eaten, and Mr. Madden, in his book, *Travels in Egypt*, states that "the flavour a good deal resembles that of a lobster, and, though somewhat tougher . . . might certainly be regarded as excellent food." On the other hand, some people who have tasted the flesh compare it to that of the sturgeon and tunny.

The Nile Crocodile, which attains a length of eighteen feet, is very fond of resting during the daytime upon the sandbanks, where it basks in the sunshine with open mouth. Between its gaping jaws a small bird known as the Black-backed Courser or Crocodile-bird may often be seen busily engaged in feeding upon the parasitic insects and leeches that lurk therein . . . the huge reptile receiving the attentions of the " feathered toothpick " with the best of grace.

In the spring the female excavates a hole in the sand and lays therein from forty to sixty eggs, after which she covers them up and leaves them to hatch by the heat from the sun. It appears, however, that sometimes she will assist in their incubation by reposing upon the top of the nesting-site.

The young ones hatch out after a period varying from four to six weeks, and prior to their breaking out of the egg they are said to give notice to their mother of the approaching event by uttering a cry, whereupon she digs down to and exposes the eggs so that the babies can at once make their way to the water as soon as they emerge.

Another of the man-eating crocodiles is the Estuarine, Marine, or Salt-water Crocodile, the range of which extends from India to Australia. As implied by its name, it frequents salt and brackish waters, and individuals have been seen swimming in the sea out of sight of land. The animal, which attains a length of twenty feet, is even more ferocious and dangerous than the Nile Crocodile, and during the breeding season will become so bold as to attack small boats in an endeavour to wreak its vengeance upon the inmates.

Several methods are employed in the capture of this crocodile, but few of us would care to adopt the practice described by Mr. Lydekker, who quotes the following incident reported in a native newspaper. A hunter and his son were hiding in a canoe near the spot where one of the reptiles had lately secured a human victim, and after waiting for some time they were rewarded for their vigilance by seeing the creature appear upon the surface of the water. The son then jumped into the water and commenced to beat upon the surface with his hands so as to attract the attention of the man-eater, whereupon the latter immediately dived, and, making its way towards the youth, soon came up at the exact spot where the commotion had occurred.

But in the meanwhile the boy had climbed back into the canoe, and the crocodile, instead of securing another meal, met the full force of a harpoon that pierced its body.

A much smaller species than the foregoing is the Marsh Crocodile or Mugger, which inhabits the rivers and lakes of India and Ceylon, and is also occasionally found in the Malay Peninsula and the adjoining islands. It seldom exceeds twelve feet in length, and has the name for being of a very timid disposition. In parts of India numbers of these reptiles are kept in semi-confinement and are worshipped by the natives. Such individuals become very tame and will even take food from a person's hand ; but this proceeding is attended with a certain amount of risk, for even the most docile crocodile may inadvertently bite *too far* and grab both the meat and the hand that holds it.

During times of drought, when the rivers and pools dry up, the animal will often make long journeys overland in search of new quarters more to its liking, but sometimes it will bury itself in the mud of the river-bed and remain there until the return of the rains.

Passing over the West African or Short-nosed Crocodile, the American Sharp-nosed Crocodile, and the Australian Long-nosed Crocodile, we now come to the largest of the crocodilians, namely the Gavial, which may attain a length of nearly thirty feet. Found in the Ganges, Indus, and Bramaputra rivers, the creature is characterized by the great length and slenderness of its snout, which, in the adult males, terminates in a knob-like swelling surmounted by the nostrils.

Gavials, which feed almost exclusively upon fish, are usually considered to be of a quite harmless disposition, and in some parts of India they are held as sacred. The discovery of human remains in the stomach of one individual, however, proves that they will sometimes attack and devour man, so it is just as well not to rely too much upon their reputation for not being dangerous.

During the breeding season the female deposits about forty eggs in a hole she excavates in the sand, placing them in two layers which are separated from one another by a foot or more of sand.

There is not much difficulty in distinguishing an alligator from a crocodile, for, apart from the dental characters we have already described, the head of the former is very short and broad, whereas that of the latter is usually elongated and terminates in pointed snout.

There are only two species of alligators, one of which comes from the South-Eastern United States, while the other, known as the Chinese Alligator, is found in the Yang-tse-Kiang River, and was first brought to the notice of naturalists in the year 1870 by the well-known explorer Swinhoe.

Although American Alligators are still very plentiful in certain parts of their habitat, in some districts they have been almost exterminated owing to the large numbers killed for the sake of their hides. Most of the skins exported from the United States are shipped from New Orleans, and it is recorded that one establishment at that city used to send away as many as ten thousand hides every month.

The Mississippi or American Alligator attains a length of about fifteen feet. In spite of the common belief that it is a slow-growing creature, such is by no means the case.

An individual hatched at the New York Zoological Park, which then measured eight inches and weighed one and three-quarters of an ounce, added twenty-two inches to its length and two pounds to its weight during the first year of its life ; while in the following year it was three feet nine inches long, and weighed fourteen pounds ; the year after that it had attained a length of six feet and a weight of sixty pounds ; and at the completion of its fourth year it was nine feet three inches long, and weighed one hundred and ninety pounds.

In the spring the female deposits from thirty to forty eggs in a nest composed of twigs, leaves, grasses, etc., piled up into a mound measuring from seven to ten feet across and several feet in height. When the eggs have been laid on this elevated platform they are covered up with leaves and decaying vegetation, which generates a considerable degree of heat and assists in their incubation. After an interval of about two months the young ones hatch out, and are then led to the water by their mother.

Alligators are not so savage as the crocodiles, and at the London Zoological Gardens the keepers will not hesitate to walk amongst them when scrubbing down the floor of their tank, for a slight prod with a broom is sufficient to keep them at a respectful distance. They are of a very lethargic disposition and lie motionless for hours on end. When disturbed they will open their mouths and hiss vigorously, while at other times they will utter a loud and deep-noted booming sound. Should their heads be partly submerged during the latter performance, the water in the immediate vicinity becomes agitated and broken up into ripples as if a wind was blowing upon the surface.

The Chinese Alligator is much smaller than its American relative and does not exceed seven feet in length. Its voice, moreover, differs from that of the latter, the sound uttered being described by Mr. E. G. Boulenger as "sharp and sudden, never prolonged, and always repeated several times in rapid succession."

In Central and Southern America the Alligator is replaced by the closely allied Caymans or Jacares, which can be distinguished from the former by having the ventral surface of their bodies protected with a bony armour.

Of the various species that are known, the Black Cayman is the largest and is said to grow to a length of twenty feet, although such individuals would be of exceptional size, and a length of fourteen feet may be regarded as the average.

Bates, during his sojourn at Ega, on the Upper Amazon, always found "one or two lying in wait near the bathing-place for anything that might turn up at the edge of the water—dog, sheep, pig, child, or drunken Indian."

"While this visitor was about," he writes, "everyone took extra care when bathing. I used to imitate the natives in not advancing far from the bank, and in keeping my eye fixed on that of the monster, which stares with a disgusting leer along the surface of the water, the body being submerged to the level of the eyes, the top of the head, with part of the dorsal crest, being the only portions visible."

Of the smaller species, the Spectacled Cayman and the Broad-snouted Cayman may be selected for special notice. The former, which grows to a length of eight feet, receives its name from the swollen, wrinkled, and horny nature of its eyelids, which, together with a horny ridge between the eyes, have a slight resemblance to a pair of spectacles ; while the latter is characterized by its broad and rounded snout, and by the structure of its upper eyelids, which often assume a horn-like formation.

The flesh and also the eggs of the Cayman are sometimes eaten by the natives.

CHAPTER XII

A TALK ABOUT LIZARDS

THE family of lizards comprises a vast number of species, as many as 1,900 different kinds having been described.

Some are quite small, but others may attain a length of as much as twenty-three feet. The majority are clothed in scales that are frequently very rough and developed into a spiny armour ; but in some species the protective covering is quite smooth, while in others the scales are absent and replaced by hard, polished, movable, transverse rings that encircle the body.

The greater number of lizards possess four limbs, but others only have two, and a few none at all. The toes are provided with sharp claws, and in certain species inhabiting sandy districts each one is furnished on either side with a row of projecting fringe-like scales that assist the creatures when walking upon the loose soil, and prevent them from sinking too far into the surface.

The teeth, which vary considerably in shape in different groups of lizards, are not embedded in sockets. Sometimes they are set upon the summit of the jaw-bones, and at other times are attached to the inner surface thereof; the former type of dentition being described as *acrodont*, and the latter as *pleurodont*.

Although some of the larger lizards are able to inflict a very severe bite, only two species are really dangerous inasmuch as they are endowed with poison-glands and specially-developed fangs for conveying the venom into the flesh of any victim that may happen to be bitten.

The shape of the tongue is very variable, and may be either thick and flattened, or long, slender, and deeply forked at the extremity like that of a serpent. Sometimes the tip is covered with a sticky secretion that assists the animals to secure their prey.

In some lizards the tail is stumpy and fat, but that of others is long and attenuated, and may be several times the length of their bodies and heads. The larger lizards employ their lash-like tails as weapons of offence for striking at their enemies, and those which have a shorter caudal appendage covered with a spiny armament will often use it in a similar manner for lacerating the flesh of their adversaries.

Many lizards have the power to discard their tails as a means of escaping from a foe that has seized hold of that member; each vertebra thereof being divided across the middle by a septum or membrane of skin, so that the two halves are but loosely-connected to one another. The point of severance always takes place at one of these divisions, and the tail breaks off neatly without loss of blood. When once it has been discarded, it continues to wriggle about for some time, and the owner scuttles off to safety.

After an interval of a few months the lost portion of the tail is replaced by a new growth, but the vertebræ are not renewed, their place being taken by a rod of hardened tissue.

The new tail is rarely as long as the old one and the scales on the renewed part are usually abnormally formed.

Lizards, except in the case of the worm-like forms that creep along the ground in the manner of a snake, are very active in their movements, and some of them can run along so fast that the eye can do little more than distinguish a blurred streak as they dart off to cover. When going at full speed, certain species will progress upon their hind legs alone, elevating their fore-quarters into the air and balancing themselves with their tails.

A few lizards are endowed with a growth of membraneous skin along the sides of their bodies, and this can be stretched out tight so as to act like the wings of an aeroplane and enable the creatures to take gliding flights from one branch of a tree to another.

Most lizards are terrestrial in habits, but some are arboreal and others aquatic or semi-aquatic.

The young of some species are produced from eggs laid by the female, and those of others are born in an active and free condition ; but the Ocellated Sand Skink is curious in the fact that the female may be either viviparous or oviparous, although as a rule she gives birth to living and fully-developed young.

Lizards do not possess a voice, but when disturbed they will hiss vigorously ; while the Geckos will give rise to a peculiar clicking sound produced by striking their tongues against the roof of their mouths.

Many of them exhibit wonderful powers of changing colour, and although such variations may be of a protective nature, and assist the reptiles to conceal themselves amidst their surroundings, the different hues displayed are merely due to a state of excitement, and are also governed to a large extent by the health of the creatures and the temperature of the atmosphere surrounding them.

The vast majority of lizards dwell in tropical and sub-tropical zones, and only three species, namely the Common or Viviparous Lizard, the Sand or Hedge Lizard, and the Slow-worm or Blind-worm are found in the British Isles.

The first-mentioned occurs in considerable numbers in many parts of England and Scotland, while, moreover, it is the only reptile (other than the batrachians, should we include such creatures under that title) found in Ireland. Its range, however, also extends over Northern and Central Europe, and parts of Asia.

Damp heaths and moors are the favourite haunts of this lizard in the British Isles, but on the Continent it is often found in dry localities amidst the mountains up to an elevation of ten thousand feet. As implied by the reptile's name, the female produces living young ones, of which there may be from six to twelve in a litter. Occasionally, however, they are born enveloped in thin membraneous sacs, from which they immediately break forth.

The Sand Lizard, which is slightly larger than the foregoing species, inhabits Northern, Central, and Eastern Europe, as well as Western Asia ; but its distribution in the British Isles is confined to the sandy heaths of Dorset and Hampshire; the neighbourhood of Farnham and Hindhead, in Surrey; and the sand-dunes near Southport, in Lancashire.

Although normally of a somewhat inconspicuous colour, during the breeding season the male assumes a bright green livery. In the month of June the female lays up to a dozen thin-shelled eggs within a depression she scoops out in the sand, beneath a heap of dead leaves, or even in an ant's nest.

The young ones emerge in July or August, and then measure about half an inch in length.

The last of the lizards indigenous to this country is the Slow-worm, which is easily distinguished by its absence of limbs and worm-like appearance. As, however, we shall be dealing with this at some length in our chapter devoted to "legless lizards," we will pass on and proceed to discuss a group known as Agamoid lizards, of which there are a number of interesting species.

Among these are to be numbered the Flying Lizards or Flying Dragons that are represented by more than two dozen species found in the Indo-Malay region. They are able to take gliding flights through the air for a distance of sixty feet or more by means of membraneous flaps of skin that arise from the sides of the body and are supported by a series of specially-developed, movable, and prolonged ribs. When the creatures are running about or at rest, the ribs and " wings " are folded back and lie along the sides of the neck and body, but during " flight " they are spread out and act as skimming planes.

One of the best known of the group is the Malay Flying-lizard (*Draco volans*), that measures about a foot in length.

Although quite inconspicuous when in repose, when gliding through the air it has been likened unto a beautiful butterfly, for its wing-membranes are of a bright orange colour, decorated with irregular-shaped black markings and bands.

Another very interesting representative of the Agamoid group is the Frilled Lizard found in Queensland and Northern Australia.

Attaining a length of about three feet, the creature is unique in the fact that it possesses an enormous cape-like frill that arises on either side of its neck. Normally this is folded up and rests along the sides of the body, but when the creature is annoyed or alarmed it expands and brings forward the frill, opening its mouth at the same time and exposing the curious saffron-yellow interior.

As the frill is brightly coloured in varying shades of yellow, speckled with scarlet, the effect produced by the sudden opening thereof must cause an enemy to think twice before attacking such a ferocious-looking creature ; but, as a matter of fact, appearances are deceptive, for the reptile is really quite harmless.

The Frilled Lizard has another curious habit for when travelling fast over the ground it will often raise itself on its hind legs and run along in an upright position with its tail held in the air.

The Rough-tailed Agama (the *Hardim* or *Kardum* of the Arabs) is worthy of special notice owing to the peculiar manner in which it will stop abruptly during its flight from an enemy, and then nod its head up and down several times before rushing off again—a habit, however, that is also common to several other kinds of lizards. Mr. Ditmars tells us that the Mohammedans consider this action to be "a travesty on their method of devotion," and, consequently, they wreak their vengeance upon the reptile and kill all those they are able to catch.

Among the lizards that are able to alter their colouring, one of the most remarkable is the Changeable Lizard or Blood-sucker, for its powers as a "quick-change" artist are far greater than those of the familiar chameleons, to which we shall be devoting a separate chapter.

Found in Eastern Asia, and being especially plentiful in India and Ceylon, the reptile measures about fifteen inches in length. Under normal conditions it is of an inconspicuous yellowish-brown colour, but when excited its throat and neck assume a brilliant red tint. The colour-changing phenomenon is especially noticeable among the males during the breeding season, for at that time they become very pugnacious and engage in fights with one another for the possession of the females.

When disporting themselves before the latter, they rise up on their hind legs, move their heads up and down as if they were bowing, and open and shut their mouths.

Passing to the Moloch Lizard or Thorny Devil, we come to a species in which the head, body, limbs, and tail are armed with a number of sharp spines, the longest of which are situated upon the back of the head and attain a length of about half an inch; whereas the creature itself measures about five inches.

Notwithstanding its formidable appearance, the lizard is quite harmless and never makes use of its prickly armour for the purpose of attack; although the spines are doubtless of a protective nature inasmuch as they render the reptile a somewhat indigestible morsel for other creatures to feed upon.

The Moloch, which comes from Western and Southern Australia, feeds upon ants; and a well-known naturalist tells us that as many as fifteen hundred of these may be consumed by an individual at a meal.

Even more remarkable than the foregoing are the Horned Lizards, or Horned Toads as they are sometimes called because of their flattened and broad bodies. Of the fifteen different kinds found in the Southern United States and Mexico, all are quite small, and none exceeds five inches in length. As in the case of the Moloch Lizard, their heads and bodies are armed with sharp-pointed and projecting spines, but the most peculiar feature in regard to the creatures is their habit of ejecting jets of blood from the corners of their eyes for a distance of several feet, when disturbed.

This phenomenon has been noted by several observers. Mr. Underwood tells us he was once examining one of these reptiles and had occasion to turn it over upon its back. This treatment caused the animal to become very much annoyed, and after showing its displeasure by opening its mouth and puffing out its body, it spurted blood from its eyes and then became limp and collapsed, as if dead.

Mr. Ditmars also had a similar experience when handling a specimen and measuring its horns with a pair of calipers.

" The shining metal," he writes, " seemed to greatly excite the lizard, which puffed up to such an extent that the eyes bulged.

"Then, without warning, a jet of blood as fine as a hair, shot from what appeared to be the corner of one of its eyes, striking a wall fully five feet away, where it was distributed in a shower of tiny drops."

In the Basilisks of Tropical America we have some lizards, belonging to the Iguana family, that are decorated with high, upstanding crests upon their backs and tails, and a helmet-like protuberance upon the head of the adult males.

Many references to the Basilisk are made by the writers of olden days. Pliny describes it as " a snake living in the province of Cyrenaica, which is no bigger than twelve fingers, and has a white spot on its head, in which it is arrayed as though by a diadem. It terrifies all other snakes with hissing, and does not move along as they do, by coiling its body many times, but goes half-upright and stretched out. They destroy shrubs not only by contact, but merely by their breath, scorch up weeds and split stones, so great is the virulence of their poison."

It was supposed to have eight feet, two large scales for wings, and its head " the likeness of a kingly crown had on."

Ælian says its poison is of such a deadly nature that the vapour arising therefrom will destroy the largest serpent, and it is able to kill a man by merely biting the end of his stick ; while in another account we are told that the poison of a basilisk that had been slain with a spear aimed at the creature by a man on horseback sprang back and killed both the steed and its rider.

Whether the fabulous basilisk refers to the creature now known by that name is an open question, but the term " kingly crown " might very well be applied to the helmet-like growth upon the head of the present-day basilisk, and its habit of running along the ground upon its hind legs alone corresponds to the " half-upright and stretched out " gait described.

Be that as it may, however, the writer managed to secure the accompanying photograph of a specimen exhibited at the London Zoological Gardens some time back without being *gassed* by the reptile, and it will be noticed that the creature is content to repose upon the hand of its keeper without making use of its reputed terrible powers.

Basilisks are mainly arboreal in habits and display remarkable agility when climbing about the branches of the trees. They are very fond of resting upon a bough overhanging the water, into which they immediately dive at the least sign of danger. When swimming, the high crest upon their backs and tails projects above the surface of the water, and certain writers with a vivid imagination have said that it is employed as a sail by the animal during its progress through that element.

We will conclude our present chapter by introducing the reader to the Heloderms or Beaded Lizards, which are unique in the fact that, of all lizards, they are the only ones capable of inflicting a poisonous bite. Their jaws are provided with a number of curved and fang-like teeth which are grooved on both their anterior and posterior surfaces for the transmission of the venom emitted from poison-glands situated at their bases.

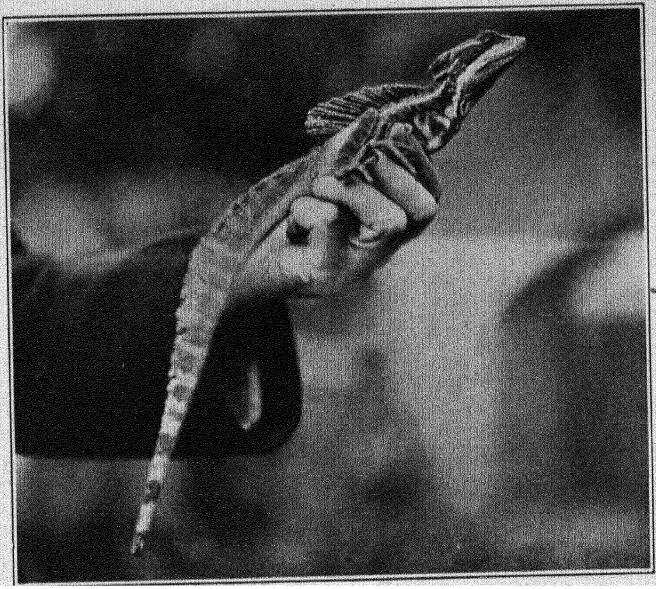
Small animals quickly succumb to the virulence of the poison, and several instances have been recorded of human beings being killed as the result of a bite from one of these reptiles.

The grip of a Heloderm has been likened to that of a bulldog, and when once it obtains a firm hold upon a victim it is a difficult matter to make it leave go.

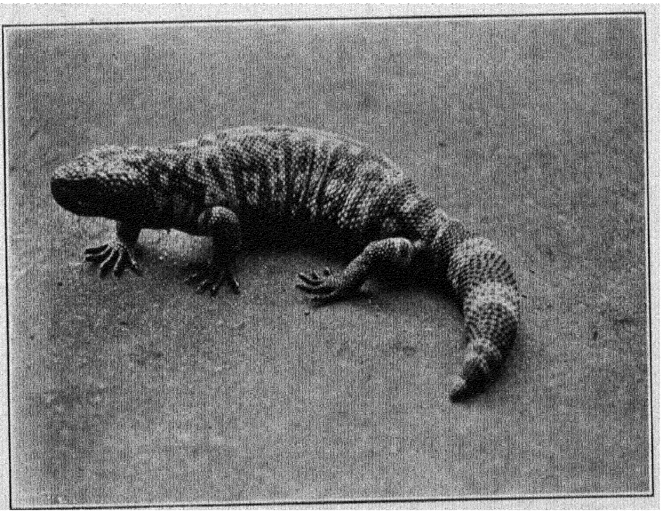
But in spite of its venomous properties the lizard will become quite tame in captivity, and those at the London Zoo are freely handled by their keepers. It is possible, however, that the docile disposition of these individuals is to a certain extent due to a state of semi-torpidity brought about by the lack of sunshine and warmth that characterizes our climate for so many months during the year.

Heloderms, which attain a length of about two feet, receive their name of "beaded" lizards because of the warty nature of their skin, which looks as if it were composed of numerous small beads placed close together.

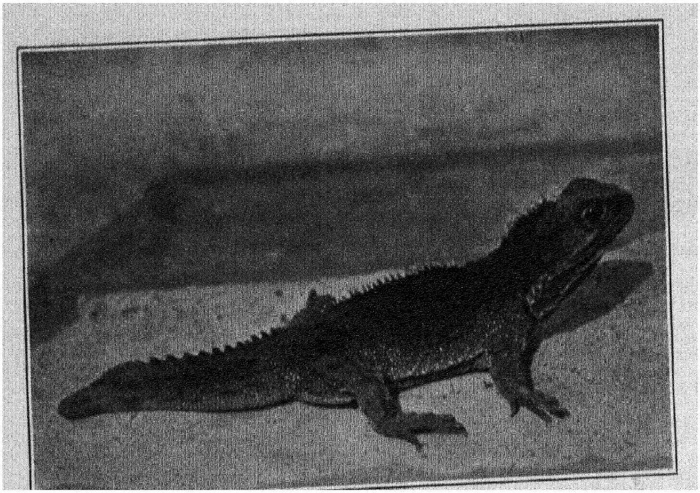
Of the two species that comprise the group, one, commonly spoken of as the Gila Monster, comes from New Mexico and Arizona, while the range of the other extends from Central Mexico to the northern part of Central America. The former is salmon-pink in colour, decorated with a net-work of irregular-shaped black markings ; while the more northern form is yellow and black, the latter colour predominating.



THE BANDED BASILISK (*See page 178*)

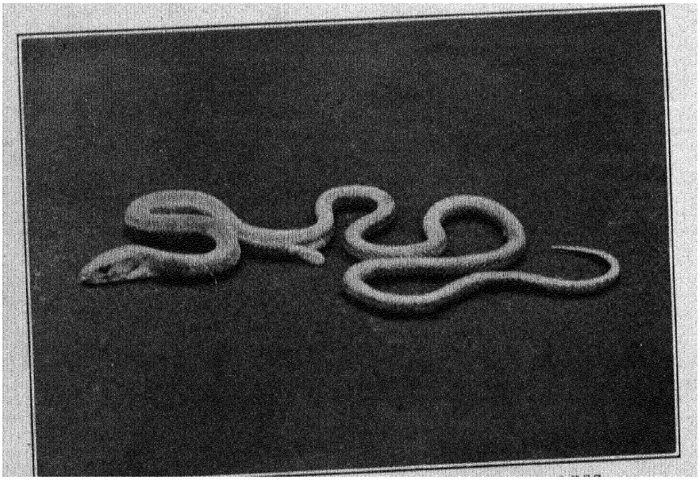


THE HELODERM, THE ONLY POISONOUS SPECIES OF LIZARD (*See page 179*)



ONCE THREE-EYED, THE TUATERA LIZARD FROM NEW ZEALAND

(See page 182)



THE SCALE-FOOT LIZARD WITH FLAP-LIKE HIND LEGS

(See page 192)

The Gila Monster is the heavier-built creature of the two, and possesses a short and very thick tail. This member constitutes a reserve for the storage of fat, so that when food is scarce the reptile is able to live for weeks merely by absorbing into its system the accumulated fatty-tissue therein.

Heloderms are oviparous, the females laying hard-shelled and white eggs that are remarkable for their large size. Some laid by an individual at the New York Zoological Park measured 2¾ inches in length and 1½ inches in breadth—the parent being 19½ inches long.

CHAPTER XIII

THE TUATERA LIZARD

ALTHOUGH commonly called a lizard, the Tuatera presents so many unique features that it is separated in Zoological classification from all other living reptiles.

It is the sole surviving representative of an ancient order of reptiles, the members of which are otherwise only known by their fossil remains. In outward appearance it is somewhat similar to the Iguana Lizards; but as its anatomical structure reveals characters that are found in both the crocodiles and tortoises, authorities regard the reptile as having arisen from the same ancestral stock as that from which both of the latter originated.

The ancestors of the Tuatera possessed a third eye upon the top of the head, and vestiges of that organ can still be traced in the individuals living at the present day. This parietal or pineal-eye, as it is called, can be seen through the thin and semi-transparent skin of young Tuateras, but as they grow up the covering becomes thick and opaque.

The Tuatera, which comes from New Zealand, was formerly quite abundant on the larger islands off the mainland, and even on the latter itself, but nowadays only a few are left on some of the small and uninhabited islands off the North-East Coast.

Of late years their numbers have become so greatly reduced that it was deemed necessary to pass special laws for their protection and to save them from extermination.

As there are lighthouses on many of the smaller islands, the keepers of these act as wardens, and from time to time send in reports to the authorities as to the welfare of those lizards residing in the different localities. On some of the islands the animals are increasing in numbers, but in others they are decreasing, partly owing to the depredations of hawks and the large bird known as the Laughing Jackass or Laughing Kingfisher.

But to trace the decline of the Tuateras we must go back to the days of Captain James Cook, the famous navigator, who presented the New Zealand natives or Maoris with a number of domestic pigs. These large, black, and long-snouted animals, as they have been described, flourished so well in their new home, and multiplied to such an extent, that some of them eventually wandered off into the bush and set up housekeeping there on their own account. Finding the Tuateras were easy to catch and pleasing to the palate, the pigs soon made a habit of including them in their menu ; even going so far as to unearth the reptiles from their subterranean burrows.

In later years when the white man began to cross the sea in numbers and settle down in the newly-discovered land, they brought with them an assortment of animals in the form of dogs, cats, stoats, weasels, etc., all of which to a greater or lesser extent began to prey upon the unfortunate lizards until, at last, none were left on the mainland.

In modern days, the collector and dealer in wild animals came on the scene, and, knowing that the reptiles were becoming scarce and commanded a good price, continued the work of decimation in the remoter parts that the four-footed enemies had commenced years ago elsewhere.

Mr. E. G. Boulenger, formerly Curator of Reptiles at the London Zoological Gardens, states that forty years ago Tuateras could be purchased without difficulty for a sum varying between twenty to thirty shillings. In 1914, however, their price had risen to about £15, but at the present day it is illegal to sell them, and they can only be obtained through the agency of the New Zealand Government.

The Tuatera, which occasionally grows to a length of about thirty inches, possesses a large head, large eyes, a stout body, and a rather thick tail. A row of upstanding spine-like growths arise at the back of the head in the form of a crest, and are continued in a modified form along the ridge of the back and tail.

The reptile makes its home in an underground burrow wherein it passes the daytime in slumber, coming forth at dusk in search of its food, which consists of small lizards, frogs, earth-worms, slugs, flies, and spiders. The entrance to the subterranean sanctum is only about three inches in diameter and just large enough to allow the reptile to squeeze through, but the sleeping chamber is more commodious and measures two or three feet in length, one foot in width, and six inches in depth.

During the months of December and January (the summer time in the Antipodes), the female lays up to a dozen eggs, each of which measures about an inch in length. As a rule she places them in a nest situated in a separate burrow away from the residential one, but sometimes they are deposited in the latter ; a special extension being made therefrom for their reception.

The eggs may be laid either all in one night or at intervals extending over a period of two or three days. They are placed in several layers, and are usually covered up with the soil that has been loosened during the work of excavation.

Having completed her work, the female fills up the entrance to the nesting-chamber with grass and leaves so as to render it as inconspicuous as possible.

The incubating period is a very lengthy one, and the young do not emerge from the eggs until a lapse of ten or twelve months after they have been laid. The babies then measure about four or five inches in length ; but as they grow very slowly they make little progress during the first year of their existence. That they live to a great age is proved by the records handed down of an individual that was kept by some Maoris for more than three generations.

According to the eminent naturalist, Mr. A. Reischek, two Tuateras are never found dwelling together. An individual, however, will often share its underground home with a pair of Petrels; the birds inhabiting one side of the chamber.

CHAPTER XIV

LEGLESS LIZARDS

BY far the most familiar of the legless lizards is the Blind-worm or Slow-worm, for it is to be found in abundance in the British Isles, as well as on the Continent, in Western Asia, and Algeria.

Owing to its elongated and cylindrical body it is often mistaken for a snake, but as it possesses movable eyelids and external ear-openings, it can at once be distinguished therefrom.

Slow-worms have for long been the victims of erroneous beliefs, and we read in an old book by Topsell: "They have been seen to suck a Cow, for this they twist their Tailes about the Cowe's Legges. The Slow-worm biteth mortaillie, and the Cow dyeth."

Even at the present day many people consider the reptile to be poisonous and even more dangerous than the viper, whereas in reality it is perfectly harmless and will not even inflict a bite upon the hand of a person who picks one up. Moreover, notwithstanding its name, it is not blind, for its eyes, although small, are highly-developed organs of vision.

Adult Slow-worms attain a length of about eighteen inches. They are usually of a greyish-brown colour, but old males are very often darker upon the back than elsewhere, and may be decorated with small, bluish spots arranged in longitudinal rows.

The young are silvery-white above and black below, with a narrow black stripe running along the back; the latter feature sometimes being retained in the adult females.

The body-covering is composed of numerous, small and highly polished scales, and during the process of shedding the epidermis is cast entire and not in flakes as in the case of other lizards.

In scientific language the Slow-worm is known as *Anguis fragilis*, the latter name referring to the extreme brittleness of the creature. When an individual is caught it contracts its muscles so as to render itself quite rigid, and the least attempt at bending will break the animal in half, the tail coming apart from the body. Like other lizards that discard their caudal appendages as a means of escaping from their enemies, the Slow-worm eventually grows a new one, but this takes longer than usual to develop.

Although Slow-worms select damp situations for their habitation, they are very fond of basking in the sunshine. They feed upon earthworms, slugs, and various kinds of insects, which they chew up with their sharp teeth, thereby displaying another different character from the snakes which swallow their prey whole.

At the end of August or during the early part of September, the female produces her young, of which there may be as many as twenty in a litter. The newly-born lizards measure between two or three inches in length, and owing to their slow rate of growth do not attain maturity until their fourth or fifth year.

The reptiles thrive well in captivity provided they are kept amidst damp surroundings, and there is a record of one individual that lived in confinement for twenty-three years.

During the winter, however, they should be allowed to hibernate, for when dwelling under natural conditions they retire below the surface of the ground at the commencement of October and do not show themselves again until the end of March.

In the lizards known as Glass Snakes or Scheltuposiks, from South-East Europe, South-West Asia, and North Africa, we have examples in which the limbs are absent except for the presence of minute rudiments of a hind pair that project from the lower surface of the body in the form of small spike-like growths.

Attaining a length of as much as four feet, the creatures are clothed in square-shaped and yellowish-brown scales, the highly polished surface of which makes them look as if they were varnished. Extending along either side there is a narrow groove-like fold, and this gives a certain degree of elasticity to the otherwise rigid body.

Unlike the Slow-worm, the Glass-snake is of a fierce disposition ; but in captivity it will become quite tame and feed from one's hand. Its food consists chiefly of mice and voles, but it will also kill and eat the viper ; and snails, birds' eggs, and young birds also form a part of its diet.

The reptile receives its name of *Glass*-snake because of its brittle nature and the manner in which it readily discards its tail in a sudden emergency, and also on account of the shiny or " glassy " appearance of its scales.

It has been said that an individual thus deprived of its caudal appendage will afterwards seek for that member and in some mysterious manner stick it on again ; or that the tail itself may even wriggle after its late owner and reconnect itself. Unfortunately, however, the story is not true.

Very remarkable are the Scale-foot Lizards found in Australia and New Guinea. Some species have no limbs, but in others the hind pair are represented by curious flap-like growths covered with small scales. Their eyes are devoid of eyelids, and the pupils assume the form of vertical slits.

Very little is known concerning the habits of these creatures, and only one living example of the genus (a specimen of the Common Scale-foot) has ever been exhibited at the London Zoo. This grows to a length of about two feet, of which the brittle tail accounts for two-thirds of the total.

The accompanying photograph shows clearly the rudimentary limbs, and although at first sight these might easily be mistaken as representing fore-legs owing to their position in relation to the rest of the body, as a matter of fact they are vestiges of hind-legs, the part of the body situated posteriorally thereto being the tail.

With the Amphisbænas we come to some worm-like lizards, most of which are limbless. Their eyes are situated beneath the skin, and are only denoted externally by two minute dots; but as the creatures dwell entirely under ground, through which they burrow like a worm, the absence of functional organs of vision can hardly be regarded as a great loss.

The body is covered with hard skin divided up into numerous squarish segments, arranged in transverse rings, which are movable like the segments of an earth-worm, so that the reptiles are able to progress with equal facility in either a forward or backward direction—the body being moved in slightly *vertical* undulations.

The lizards are of almost equal thickness throughout their length, and the head joins the body without any constriction at the neck. This peculiarity has given rise to the fable that the animals have a head at either end of their bodies, and Pliny writes: "The Amphisbæna has two heads; that is, it has a second one at the tail, as though one mouth were too little for the discharge of all its venom."

One of the most familiar representatives of the group is the Sooty Amphisbæna, from Tropical America and the West Indies, that receives its name from the dark-coloured blotches upon its otherwise uniformly-tinted yellowish skin.

Measuring about eighteen inches in length, the reptile is very fond of dwelling in the nests of the Saüba ants.

According to Bates, "the natives call the amphisbæna the *mai das saübas*, or 'mother of the saübas,' and believe it to be poisonous, although it is perfectly harmless. . . . They say the ants treat it with great affection, and that if the snake be taken away from a nest the saübas will forsake the spot."

As, however, the lizard feeds upon the ants, the relations between the two appear to be of a somewhat one-sided nature.

The group known as Two-handed Amphisbænas differ from the typical forms by having a pair of absurdly small fore-legs situated quite close to the head. Although quite useless as organs of progression, these limbs are well-formed and each one is provided with five toes.

Legless lizards are also to be found amongst the Skinks, such individuals being worm-like in form.

CHAPTER XV

GIANT LIZARDS

THERE are certain lizards that arrest attention because of their enormous size, and it is with these we propose to deal in the present chapter.

The largest of all are the Monitors, which are represented by twenty or more different kinds found in Africa, Southern Asia and Australia. Of the living races, one is believed to attain a length of twenty-three feet, but the fossilized remains of extinct species show that individuals as much as thirty feet in length existed in olden days.

The name " Monitor " originated in a very peculiar manner. The Egyptian representative of the group is called *waren* by the natives (a term also applied to designate other kinds of lizards), and this name has been confused with the German word *warnen*, meaning " to warn," and afterwards translated into the Latin word *monitor*, " a warner." But having arrived at the derivation of the name, it is necessary to explain that the reason why it was applied to the lizard was because of the common but erroneous belief that it gave warning of the approach of crocodiles by uttering a loud hissing or whistling sound.

Monitors are characterized by the great length of their bodies and tails, the latter, which are not of a brittle nature and cannot be discarded and renewed, being laterally compressed in water-frequenting species, and rounded in those that dwell upon the ground. The long tongue is deeply forked at the extremity, and, like that of a snake, can be withdrawn into a basal-sheath.

The Comodo Monitor, from the island of that name in the Malay Archipelago, is the largest of the existing species. It was only brought to the notice of zoologists of late years, and although reported to grow to a length of twenty-three feet, none exceeding thirteen feet have so far been procured.

Of the more familiar kinds, the Banded Monitor, Water Monitor, or *Kabara-goya* of the Singalese, attains a large size and may measure as much as nine feet in length. It is found in Ceylon, Bengal, the Malay Peninsula and Archipelago, and Southern China, where it frequents marshy districts, spending much of its time resting upon the branches of trees overhanging the water, into which it dives head-first when disturbed, swimming away to safety.

It feeds upon small mammals and birds, pouncing upon its victims, gripping them with its powerful jaws, and shaking them in the manner of a dog worrying a rat. As in the case of other Monitors, it is very partial to bird's eggs, and it will also sup upon those of the turtle, procuring the latter by digging them from out of the sand.

Some of the Hindoos eat the flesh of this reptile ; while the Singalese employ its fat as an ointment for the cure of various diseases.

Of the African species, the Nile Monitor, the Cape or White-throated Monitor, and the Grey or Desert Monitor, may be mentioned as well-known examples. The former, which grows to a length of six feet, is found in considerable numbers in the region of the Upper Nile, and owing to its reputation for being a devourer of crocodiles' eggs the natives refrain from molesting it.

The Cape Monitor is not quite so large as the foregoing species, and is also less aquatic in habits. Known by the Boers as the "adder," the creature inhabits districts where rocks and cliffs abound ; concealing itself between crevices, and wedging itself so firmly therein that it can only be dislodged with the greatest difficulty.

With the Grey Monitor we come to one of the smaller kinds that rarely measures more than four feet in length. It is found in North Africa, South-West Asia, and Arabia, where it dwells amidst the sandy deserts; the yellowish-grey colouring of its body harmonizing so well with its surroundings that the reptile is difficult to detect unless it be on the move.

Although unable to climb, it is extremely active in its movements and can easily outpace a man in chase; but when cornered it will face its adversary and lash out with its whip-like tail.

The majority of Monitors are very sombrely coloured, but in the Australian Lace Monitor we have an example that proves an exception to the general rule, for its body is decorated with light-coloured spots and streaks, and its throat is adorned with lemon-yellow and azure-blue tints. Individuals kept in captivity, however, soon lose their colouring.

The reptile is very arboreal in habits, and feeds chiefly upon birds and their eggs. It is not regarded with favour in poultry-farming districts owing to its habit of dining upon new-laid eggs and young chickens.

The giant lizards are represented in Tropical America by the Tejus or Teguexins, which measure about four feet in length.

The most familiar is the Common Teguexin, a handsome-looking creature with olive-coloured skin decorated with black bands and irregular-shaped markings, as well as a number of pale-yellowish spots ; while the Red Teguexin, found only in the Argentine, is of a peculiar brick-red tint with transverse band and spots of a darker shade.

The hind feet of these lizards are much larger and more powerful than the front pair ; the tongue is forked at the extremity ; the cheeks are provided with inflatable pouches ; while the tail is very long and employed as a weapon.

The animals are carnivorous in their diet and feed upon small mammals, which they tear to pieces either by seizing and shaking them in their mouths, or else by holding them with their fore-feet and biting with their teeth. Although Tejus have the name for being of a very savage disposition in a wild state, they will become quite tame in captivity.

Passing to the Iguana family, we find several kinds that are entitled to be described as " giant lizards."

The largest species is the Tuberculated Iguana, from Tropical America, which sometimes exceeds five feet in length ; the long tail accounting for more than one-half of the total.

A crest of long spines extends along the ridge of the back, and a large lappet of skin depends from the throat. The prevailing colour of the reptile is dark-green, but a white band is present in front of the fore-limbs, and the tail is decorated with a number of transverse, black bands.

The lizard is usually to be found in the neighbourhood of water, and is a capable swimmer ; but most of its time is spent amidst the branches of the trees. If brought to bay it is able to render a good account of itself ; inflicting severe bites upon an enemy and making use of its tail as a weapon.

The female produces a dozen or more eggs at a time, and deposits them in a hole she excavates in sandy soil ; but as several individuals may make use of the same nest, as many as one hundred eggs are often found together.

The flesh of this Iguana, which is said to taste like chicken, is frequently eaten ; the reptiles being chased and captured with the aid of trained dogs, or else procured by means of a running-noose of cord that is attached to the end of a long rod and passed over their heads. Live Iguanas are often displayed for sale in the American markets, their hind-feet being tied together so as to prevent them from running away.

Numbers of these lizards also fall victims to the long-snouted creatures known as Coatis or Coatimundis, which combine in parties for the purpose of hunting their prey ; some of them chasing the reptiles amidst the branches of the trees, while others follow along the ground ready to pounce upon any of the quarry that may endeavour to escape in their direction.

The Galapagos Sea-lizard or Marine Iguana is a very interesting species, for not only does it frequent salt-water, but it feeds entirely upon sea-weeds. Measuring nearly four and a half feet in length, it possesses a short and blunt-ended head surmounted by a number of cone-shaped excrescences. An upstanding crest extends from the back of the neck to the end of the tail ; the latter being laterally compressed and admirably adapted for use as an organ for progression through the water.

Mr. Charles Darwin, who was the first to discover this reptile, gives a very interesting account of the creature in his book, *The Voyage of the Beagle.*

He states : " It is extremely common on all the islands throughout the group, and lives exclusively on the rocky beaches, being never found, at least I never saw one, even ten yards in shore. It is a hideous-looking creature, of a dirty-black colour, stupid, and sluggish in its movements. . . . They are occasionally seen some hundred yards from the shore, swimming about."

The lizard is able to keep under water for a considerable time, and we are told that on one occasion an individual was captured and sunk beneath the water, by having a heavy weight attached to it, in order to kill it ; but when it was drawn up to the surface after an interval of an hour, it was still alive and quite active.

Curiously enough, although these lizards are such capable swimmers, they refuse to enter the sea when approached by man, allowing themselves to be caught rather than swim away to safety. Even when thrown into the sea by their captors they will more frequently than otherwise return at once to the spot from whence they were launched forth. They are quite harmless and never attempt to bite, but when greatly alarmed will eject water from their nostrils.

Mr. William Beebe, who lately paid a visit to the Galapagos Islands, found the reptiles so tame that it was possible to stroke them. Although a number of them were caught by means of a fishing-rod and a noose of line, the lizards seemed rather to enjoy the novel experience of being whisked through the air. Indeed, one individual was liberated and caught again in this manner six times in succession, but the treatment only appeared to make him tamer.

Mr. Beebe also confirms what Mr. Darwin reported in regard to their habit of ejecting a thin shower of water-vapour from their nostrils, and says that "if only a spurt of flame had followed the smoky puff of vapour, we should have had a real, old-fashioned dragon."

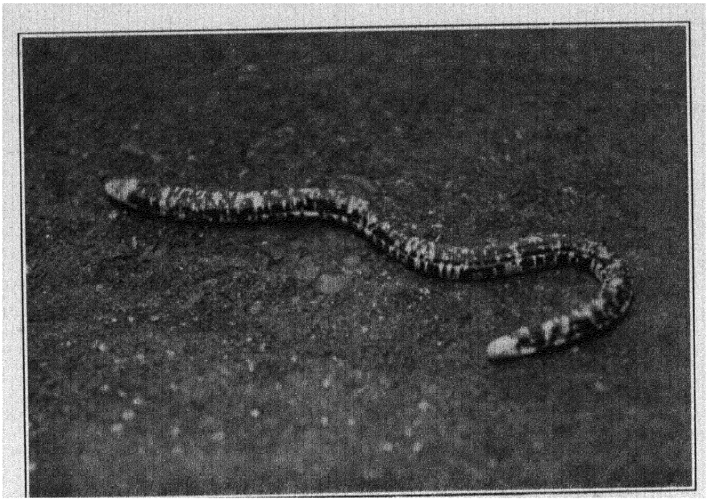
Although so plentiful in their haunts, no living example has ever been seen in this country. One individual, however, was exhibited at the New York Zoological Park some time back, but it refused to feed and only lived for a few weeks.

The Galapagos Islands are also the home of a large land-dwelling lizard, but this is about a foot shorter than the marine form.

Darwin tells us that on James Island he found them in such abundance that it was with difficulty he culd find a suitable piece of ground free from their burrows whereupon to erect a tent ; and as the burrows were excavated quite near the surface of the ground, the walls would collapse if anyone trod over the spot.

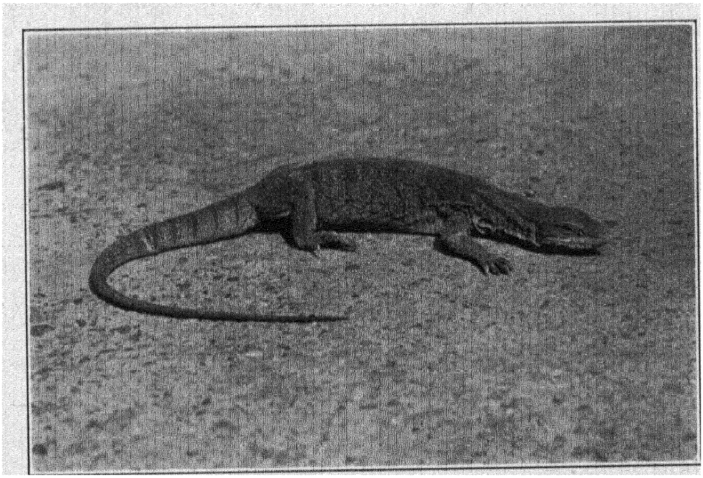
"They are not at all timorous," he writes, but, "when attentively watching anyone, they curl their tails, and, raising themselves on their fore-legs, nod their heads vertically, with a quick movement, and try to look very fierce ; but in reality they are not so at all ; if one just stamps on the ground, down go their tails, and off they shuffle as quickly as they can."

They feed upon leaves of trees and those of the cactus plants, obtaining from the latter the greater part of the moisture required for their needs, as in many parts of their habitat there is no water to be found.



THE SOOTY AMPHISBAENA, A LIMBLESS, BURROWING LIZARD

(See page 193)

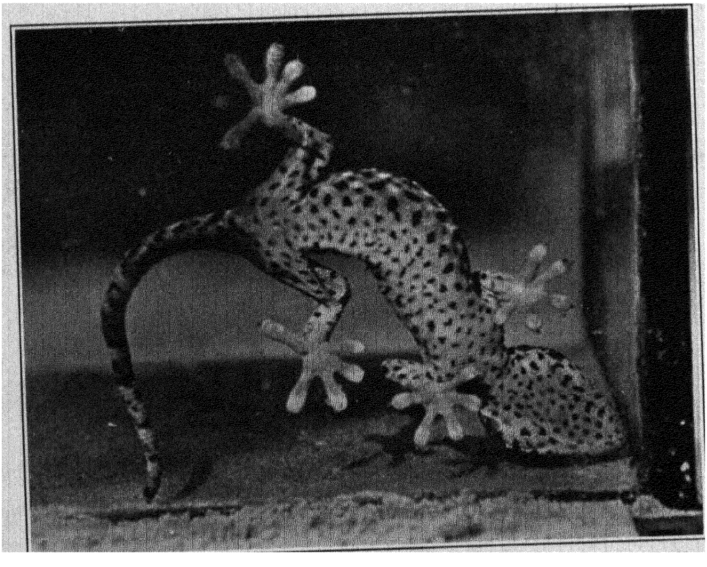


THE GREY MONITOR, A LIZARD THAT MEASURES FOUR FEET IN LENGTH

(See page 198)

THE TUBERCULATED IGUANA WHICH SOMETIMES EXCEEDS FIVE FEET IN LENGTH

(See page 199)



A VERTICILLATED GECKO ADHERING TO A SHEET OF GLASS WITH ITS SUCKER-LIKE FEET

(See page 207)

CHAPTER XVI

GECKOS AND SKINKS

THERE are about three hundred different kinds of Geckos, the distribution of which extends over the tropical and warmer parts of the world. Most of them are quite small ; the largest being about fifteen inches long, while the majority do not exceed three or four inches in length.

In the greater number of species the eyes are not provided with eyelids, but are protected by a transparent shield that may be compared to a miniature watch-glass ; while the toes are usually furnished with sucker-like discs, thereby enabling the creatures to cling to smooth surfaces, or to walk upside down upon a ceiling.

Although the reptiles are quite harmless, popular superstition has credited them with all sorts of terrible powers.

They are supposed to emit poison from their toes, and to produce an eruption upon the skin of a person they crawl over . . . the Lobe-footed or Fan-footed Gecko, found in North Africa, Arabia, and Syria, being known by the Egyptians as the *Abouburs*, meaning the " father of leprosy." It is even reported that one species possesses such powerful teeth that it is able to indent a piece of steel by biting upon it.

Most Geckos are nocturnal in habits, but a few are diurnal. The majority dwell amidst the branches of trees, but some take up their residence in human habitations, while others are ground-dwellers and burrow beneath the sandy soil of the desert regions they inhabit. The latter do not possess adhesive discs to their toes, and are also of more slender build than most Geckos. In some species the toes are provided with retractile claws. The flattened body is supported by short legs, while the tail is of a very brittle nature and easily discarded.

As previously mentioned, the reptiles give rise to a curious clicking sound with the aid of their tongues, but it is also stated that some species will produce a noise by rubbing together certain roughened scales upon their bodies.

Among the more remarkable species are to be numbered the Flying Geckos, which have a membraneous flap of skin arising from either side of the body and connected to the fore and hind limbs ; while the tail is also edged with a flattened, fringe-like growth of skin. These outgrowths act as resisting-planes to the air, and enable the creatures to undertake gliding flights from one tree to another.

The Flying Geckos, of which there are two species, come from the Malay Archipelago and Peninsula, and attain a length of about eight inches.

The Fringed or Bark Gecko is another example in which the body and tail is provided with a membraneous expansion of the skin ; but that upon the former assumes the form of a narrow fringe, and is not sufficiently developed to serve as a parachute-like support.

The creature receives its name of *Bark* Gecko because of the curious mottled markings upon its head, limbs, body, and tail, which render the lizard almost invisible when resting upon the lichen-covered bark of a tree. It would appear, however, that the animal is subject to a considerable degree of variation in regard to these markings, for individuals have been exhibited at the London Zoo without any traces of the same.

The largest of the present group of lizards is the Verticillated Gecko found in Bengal, Southern China, and the Malay Peninsula and Archipelago. The natives call it "Tokay" from the sound of its cry, which is very loud and uttered several times in rapid succession. The sporting fraternity in Siam amuse themselves by betting upon the number of times one of these lizards will utter its call within a prescribed period of time.

Unlike other Geckos, the present species is not solely insectivorous in its diet, but supplements such fare by devouring bats, mice, other lizards, and young birds.

Of the smaller kinds of Geckos, the majority do not call for any special comment ; but in the Naked-toed or Fat-tailed Geckos, of which there are a number of different species found in Southern Europe, Asia, Australia, and South America, we have some examples that exhibit several peculiar characters. Their digits, for instance, are not expanded into the form of suckers ; while their somewhat short tails are very fat and contain a storage of nourishment that the creatures are able to absorb into their systems so as to tide them over periods when food is scarce.

The only living example of this group ever seen at the London Zoological Gardens was an Australian species. It was of a peculiar purplish-brown colour, marked with a number of small, cream-coloured spots. But the most curious character it revealed was its manner of progression, for, unlike other Geckos, which walk along with their bodies just clearing the ground, it would raise itself high on its legs, arch its back in a manner that reminded one of the pose assumed when a cat is confronted by a dog, and then walk slowly away. Whether all Geckos of this kind act in this way, the writer is unable to say, but the habit of the animal in question was so unusual that we consider it worthy of being recorded.

The Skinks are even more varied in form than the Geckos, for whereas some have two pairs of well-developed limbs, those of others are quite small and the front pair may be absent, while a few have none at all. The number of their toes, moreover, is also very variable, for although the feet of some kinds are each provided with the normal array of five, others may have but four, three, two, or a single minute and undivided rudiment.

Skinks are found in all parts of the world, but are more plentifully represented in Australia, Southern Asia, and Africa, than elsewhere. The majority frequent dry, hot, and sandy districts, and are terrestrial in habits ; but others are to be found amidst grass and herbage, and a few are arboreal.

One of the most familiar of the vast number of different species is the Egyptian or Common Skink found in Southern Europe, Southern Asia, Syria, Persia, and North Africa.

The Arabs, who call it the " sand-fish," eat its flesh and believe it to be endowed with curative powers against various diseases ; while in olden days the Greeks and Romans employed the dried and powdered bodies of the creatures as a medicine ; the scales of the nose and feet when boiled in white wine being regarded as a highly efficient remedial agent.

This lizard grows to a length of from six to ten inches, and is covered with small, smooth, and glistening scales of a pale-yellow tint, decorated with brown, mauve, or purplish markings. It dwells amidst the sand, into which it will burrow with the aid of its shovel-like snout.

A very high temperature is necessary for its well-being, and for this reason the reptile is somewhat difficult to keep in captivity in this country.

Another well-known species is the Ocellated Sand-skink, which occurs in South-West Asia, North Africa, Sardinia and Sicily. It receives its name from the small, black and white ocellar or eye-like spots that decorate its otherwise brown-coloured body.

As mentioned in the previous chapter, the female is usually viviparous, but individuals kept in captivity have been known to lay eggs.

Australia is the home of a curious-looking skink known as the Stump-tailed Lizard. Its caudal appendage is very short, broad and of almost the same shape as the creature's head ; so much so, indeed, that the reptile was originally described by its discoverer as a double-headed lizard. Reference to the accompanying illustration will show the similarity between the two ends of the creature, the head-like appearance of the tail being further accentuated by the manner in which the hind-legs project from the sides of the body.

The animal is of a very lethargic disposition, and when basking in the sunshine will not trouble to move for man or beast. Consequently, it is easily captured, and the Colonials call it the " Sleeping Lizard."

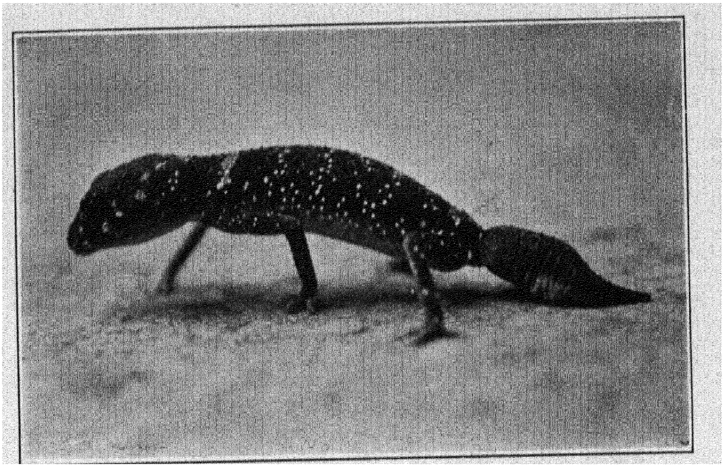
As in the case of some other lizards we have mentioned, its tail serves as a reservoir for the storage of fat that can be utilized as nourishment by the creatures when hibernating during the winter months. The animal feeds upon snakes, lizards, worms, and fruit. The female, which is viviparous, is unique in the fact that she only gives birth to a single young one at a time, and this is remarkable for its enormous size, its length being about half that of its parent.

The Giant Skink, Great Cyclodus, or Blue-tongued Lizard, is another well-known Australian species, although its range also extends to the Malay region.

Receiving its name from the purplish-blue colour of its tongue, the creature is the largest of the skinks and may attain a length of as much as two feet. Its body is of a slaty-grey tint, decorated with dark bands.

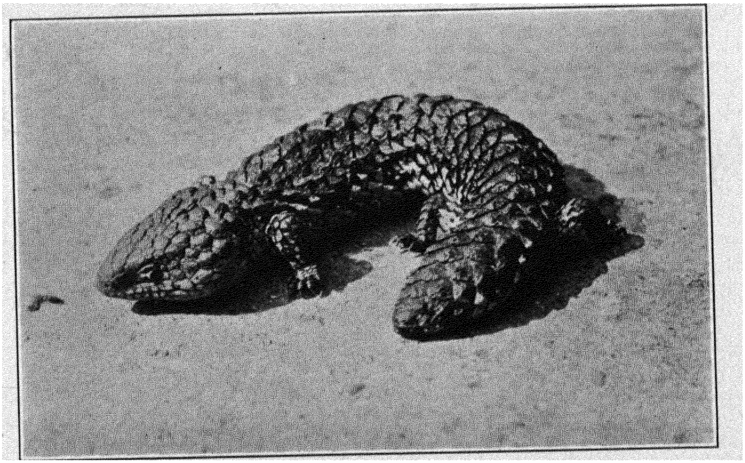
The species thrives well in captivity, and an individual formerly at the London Zoo lived there for more than thirteen years. The female is viviparous, and sometimes produces as many as twelve young ones at a time.

We will conclude our remarks on the skinks by mentioning the Three-toed Bronze Lizard, Three-toed Skink, or Seps, as being a typical representative of those species in which the limbs have become so reduced in size that, unless carefully searched for, they might easily be overlooked. These minute legs, which in the present species are each provided with three toes, are quite useless as organs for progression, and when the reptile is on the move it folds them against its body and wriggles along like a snake.



THE FAT-TAILED GECKO FROM AUSTRALIA

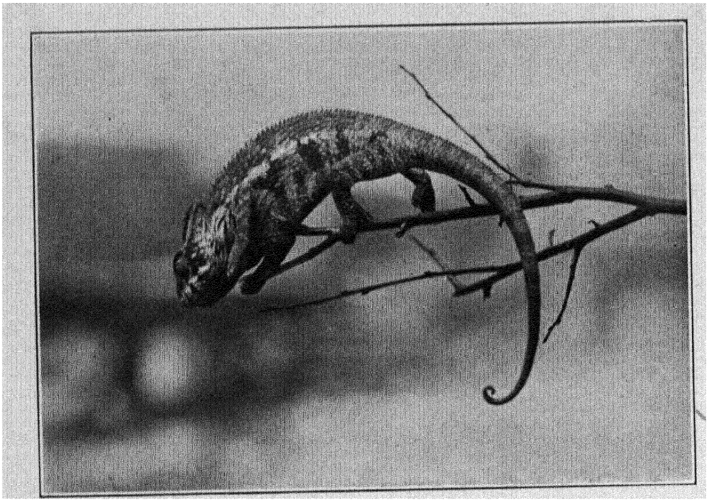
(See page 208)



THE STUMP-TAILED SKINK

Note the similarity between the head and tail

(See page 211)



THE WARTY CHAMELEON

THE HAIRY-SIDED FROG

(See page 222)

The Three-toed Skink attains a length of about thirteen inches, of which the tail accounts for nearly one half. It is found in Southern Europe and North Africa, where it frequents damp situations, and feeds upon worms, snails, slugs, and insects.

Although perfectly harmless, it has for long been persecuted owing to the erroneous belief that it is poisonous and has the habit of killing cows by biting them as they sleep at night.

CHAPTER XVII

CHAMELEONS

THE capacity for changing colour has rendered the chameleons famous, but their powers in such respect have been greatly exaggerated, and are not so pronounced as in the case of some of the typical lizards. Many people are under the impression that they can change suddenly from one colour to another, but such a belief is quite erroneous for the transformation is accomplished very slowly. It is also commonly reported that the reptiles habitually assume the same colour as their surroundings, but, as a matter of fact, the different hues they display are governed by the creature's emotions, and are also controlled to a great extent by changes of temperature and varying intensities of light.

Many experiments have been made with chameleons to test their colour-changing powers. An individual shut up in a dark box and kept in a temperature of 75 deg. Fahr.

assumed a green tint, but another one enclosed in a similar manner, but only subjected to a temperature of 50 deg. was of a slaty-grey colour.

Other chameleons were illuminated by lamplight, the rays from which were concentrated upon one side of their bodies, with the result that the illuminated part gradually changed from a greyish to a yellowish-green tint, leaving the other side unaltered. It was found, however, that unless the rays of light actually reached the chameleon's eyes no change took place.

Three other chameleons were placed separately in evenly-lit glass-fronted cages, one of the reptiles being given green leaves for its surroundings, another brown twigs, while the third rested upon a bed of white sand. All of them assumed the same tint, thereby showing that the intensity of the light, and not the colour of their environment, was the factor governing the hues they displayed. Indeed, colour in itself appears to have no effect in the transformation of the reptiles, for even if rays of light be directed upon them through red or green glass, they remain of the same colour as they were before, although the blue-violet rays of the spectrum appear to affect them, for these are of a highly actinic nature, as photographers are well aware.

Although, as we have just seen, the colour-changes of chameleons are brought about by the influence of heat, light, and emotions, they are not actually produced thereby, but are caused by the change of position of numerous minute cells or corpuscles that lie under the skin and contain different coloured pigments, which may be concentrated in the deeper parts of the skin or spread over the upper layer.

Chameleons are of an extremely lethargic disposition, and when they do move progress in such a deliberate manner that it looks as if their joints wanted oiling. They will remain clinging to a branch for hours on end without changing their position, but their eyes are constantly being shifted about on the look-out for flies or other insects upon which they feed.

The eyes are very large and, except for a small circular opening revealing the pupil, are encased in a covering of scaly skin formed by the junction of the upper and lower eyelids. They can be rolled about in all directions, and, as each one is capable of being moved independently of its fellow, the creature is able to see before and behind, or below and above itself at the same time without moving its head.

But even more remarkable is the tongue, which, when fully extended, is almost as long as the animal's head and body. It is of a very elastic nature, and is supported by a slender and bony rod ; while the extremity is formed into a thickened expansion covered with a sticky secretion.

When a chameleon espies a fly settling on a leaf, it approaches very cautiously until within a distance of from four to six inches in the case of the smaller species, but farther away in the larger ones, and then, after a moment's hesitation, as if it were judging its aim, suddenly throws forward its tongue with a rapidity that the eye can scarcely follow, and withdraws it into its mouth with the prey adhering to the tip.

The tail is of a prehensile nature, while the feet are peculiar inasmuch as they are divided into two opposable flaps ; those of the fore-feet being provided with two toes on the outer part and three on the inner, and those of the hind-feet having this arrangement reversed.

Chameleons are of a quarrelsome disposition. When indulging in combat they inflate their lungs so as to make themselves look as large as possible, a habit that probably gave rise to the old belief that the creatures lived entirely upon air.

In some species the males possess long, bony, skin-covered horns that project in a forward direction from the snout or above the eyes; but these embellishments can hardly be regarded as weapons capable of inflicting injury, but rather as "battering-rams" for pushing one another about with.

The majority of chameleons are of small size and rarely exceed ten inches in length, although two species found in Madagascar attain a length of twenty-four inches or more.

The most diminutive is the Cape or Dwarf Chameleon, which grows to a maximum length of five inches. It is one of the few species in which the female produces living young ones, of which there may be as many as a dozen in a litter. The babies are very precocious, and those born in captivity have been known to commence catching flies when but an hour old.

The Cape Chameleon is much hardier than most kinds, but its powers of changing colour are but feebly developed. It is not often imported into this country, the Common Chameleon from Southern Spain, Northern Africa, Syria, and Asia Minor, being the kind most frequently seen.

The latter differs from the Cape Chameleon by being oviparous. During the month of October the female descends from the branches of the trees in order to lay her eggs, which are deposited in a hole excavated in the ground, covered up with soil, and then left to hatch. The young ones do not emerge until the following spring, and in the meanwhile the parent has buried herself in another hole in the ground, where she remains until the warm weather awakens her to activity.

Those who keep chameleons in captivity should remember that as their normal method of drinking is to lap up drops of moisture from leaves, it is of little use to offer them liquid from a bowl. They should be given live insects, grubs, etc., to feed upon; but a contributor to a certain magazine informs us that he kept one for a considerable time upon a diet of *boiled cabbage*, which was cut up small and put in a saucer.

" He did not take it with his tongue," to quote the exact words of the narrator, "but opened his mouth and took it in so. To-day he is alive and well and has had nothing to eat but boiled cabbage for the last five months. This is given him fresh every day, and when it is put in the cage he seems to recognize it by the odour, and goes for it across the cage, moving very slowly and deliberately."

Truly a remarkable story, and one that we leave the reader to believe or reject as he thinks fit.

CHAPTER XVIII

FROGS AND TOADS

TAKING leave of the typical reptiles, we now come to the Amphibians or Batrachians, which are divided into three groups, namely, the Tailless Amphibians, the Tailed Amphibians, and the Limbless Amphibians.

The first-mentioned group comprises the frogs and toads, of which about twelve hundred different species are known. Some of them are purely aquatic, others only frequent water during the breeding season, others are terrestrial and may make their home in underground burrows, while a number are arboreal in habits.

The majority are born in the water and undergo a series of changes before reaching maturity—the young or tadpoles emerging from eggs that are enveloped in a jelly-like substance, and breathing by gills throughout the early stages of their lives.

In some instances, however, the metamorphosis takes place within the egg, and the young break forth therefrom as fully developed, lung-breathing creatures.

The eggs, which may be deposited either singly, in long strings as in the case of the Common Toad, or in masses like those of the Common Frog, vary considerably in numbers according to the species that produces them, some laying as few as twenty at a time, while others, as exemplified by the Green Toad, may deposit as many as twelve thousand.

The spawn of the Common Frog, which used to be eaten by the gipsies as a cure for rheumatism, is to be found floating upon the surface of ponds and slow-running streams, but that of the Common Toad is twisted about the fronds of submerged aquatic plants.

The skin of all Amphibians is naked, except in the case of the Hairy-sided Frog, found in the Cameroons, the males of which are provided during the breeding season with a fringe of hair-like appendages arising from their thighs and the sides of their bodies. Numerous glands are present upon the skin, and in the majority of toads these form wart-like excrescences on the body and large swellings on either side of the head, behind the eyes.

A poisonous fluid is secreted from these glands, the virulence of which varies in different species of frogs and toads.

That of the Common Frog is sufficiently powerful in its action to make a dog foam at the mouth should it be so indiscreet as to pick up one of the creatures ; and it is recorded that a man who bit off a toad's head for a wager became seriously ill, his throat, tongue, and lips swelling up in the most alarming manner.

A certain species of tree-frog found in Tropical America yields a very active poison that is employed by the natives for the purpose of poisoning their arrow-tips.

Frogs and toads are unable to drink, but absorb all the moisture necessary for their needs through their skin. When frightened, it is a common practice for them to expel fluid from their bodies so as to make themselves as small and inconspicuous as possible.

The eyes of frogs and toads are of considerable size, and each one is provided with two eyelids and a nictitating membrane, which passes upwards over the eye. The lower lid is immovable, but the upper one is well developed, and in some species forms an upstanding horn-like process.

The pupils of the eyes are of various shapes, in some species being contracted into a heart-shaped opening, while in others they may assume the form of a vertical slit or the shape of a keyhole.

No true ears are present, but those organs are usually represented by oval discs covered with skin. The tongue may be absent, but when present is thick and flat. Sometimes it is completely fixed to the floor of the mouth, or may only be attached to the front thereof with the extremity pointing towards the throat, while in some species it can be protruded like that of a chameleon.

Teeth may be present in both the upper and lower jaws; in one only; or they may be absent. The hind-feet are usually webbed, and occasionally the front ones also. The toes of arboreal species are dilated at the tips, but the expansions are not in the nature of suckers, as in the case of the majority of the geckos, but owe their adhesive power to a sticky substance secreted therefrom, aided by muscular pressure.

Burrowing species often possess horny spurs upon their toes, while other kinds may have spine-like growths upon their arms or on the breast, which serve as weapons.

The vocal sacs of frogs and toads are often very large, and the creatures are able to produce a considerable volume of sound.

The Common Frog utters a croaking noise, while the voice of the Edible Frog has been likened unto a snore. So continuous is the noise produced by the latter during the breeding season, that in olden days the French nobility used to employ peasants during the night time to beat the ponds in the vicinity of their châteaux with boughs of trees so that their slumbers should not be disturbed. In some parts of the Continent these frogs are called "Dutch Nightingales," while in this country, where they occur in Cambridgeshire and Norfolk, they are often spoken of as "Cambridge Nightingales."

The North American Bull Frog has a voice more powerful than that of any other species, and its croakings can be heard for a distance of more than a mile ; while the Argentine Dwarf-toad is curious in the fact that it utters sounds that are somewhat similar to the notes produced by a greenfinch.

The South American Barking-frogs or Ceratophrys inflate their bodies and wail like an infant, and also give rise to deep-sounding notes that can be heard for a considerable distance.

Among the Tree-frogs there are several species that have remarkable voices. The Golden Tree-frog, for instance, produces two distinct cries, one of which resembles the sound produced by a mason when working with chisel and mallet upon a piece of stone, while the other, uttered during the summer months, is like the noise made by cattle-bells—the resemblance being so great that farmers searching for their cows at dusk often have great difficulty in distinguishing the one sound from the other.

Another Tree-frog, which comes from Brazil, and is known as the "Ferreiro" or "Smith," utters sounds suggestive of those produced by the beating with a mallet upon a copper plate; while a third species, found in Tropical America, makes a noise as if a person were running his fingers over the teeth of a comb.

The Grasshopper Frog also possesses a curious voice, its cry being of a very piercing nature and resembling the sound produced by a grasshopper; while the Piping-frogs of Central and Southern America derive their name from the low piping-cry they utter.

Frogs and toads exhibit various methods of locomotion.

The majority progress over the ground in a series of leaps, the Agile Frog, which has exceptionally long hind-legs, being able to cover a distance of six feet at a single bound; but others, as exemplified by the Argentine Dwarf-toad and the Natterjack Toad, never hop, but move along by walking or running.

India is the home of a curious frog that actually leaps along the surface of the water as if it were on dry land ; but even more remarkable is the method of progression displayed by the Flying-frogs, of which there are a number of different species found in Southern and Eastern Asia, and Madagascar.

They are able to take gliding flights through the air in a downward direction by means of their enormous webbed feet, which act as skimming-planes for the support of their bodies.

Describing the Bornean Flying-frog, Mr. Wallace states :

" I found the toes very long, and fully webbed to their very extremity, so that when expanded they offered a surface much larger than that of the body. The fore-legs were also bordered by a membrane, and the body was capable of considerable inflation. The back and limbs were of a very deep shining green colour, the under surface and inner toes yellow, while the webs were black, rayed with yellow. The body was about four inches long, while the webs of each hind-foot, when fully expanded, covered a surface of four square inches, and the webs of all the feet together about twelve square inches.

As the extremities of the toes have dilated discs for adhesion, showing the creature to be a tree-frog, it is difficult to imagine that this immense membrane of the toes can be for the purpose of swimming only, and the account of the Chinaman (who brought the frog to Mr. Wallace to examine), that it flew down from a tree, becomes more credible."

Some frogs and toads have the curious habit, when disturbed or frightened, of assuming a death-like pose in a somewhat similar manner to the Hog-nosed Snake mentioned in a previous chapter. Darwin's Frog, a small species from Brazil with a very pointed snout, will behave in this way, throwing itself upon its back and remaining motionless with outstretched legs as if it were dead ; while the Fire-bellied Toad and the closely-allied Yellow-bellied Toad, will contort its body in the most remarkable manner, throwing itself upon its back, elevating its head into the air, turning out its elbows, and holding its fore-feet against its chin. In this position it will remain motionless for a considerable period, in all probability hoping that the disturber of its peace will come to the conclusion that it is not a toad, and pass on.

Although there are such a vast number of different species of tailless amphibians, only four, namely, the Common Frog, the Edible Frog, the Common Toad, and the Natterjack Toad are found in the British Isles.

These are so well known that no detailed description of them is necessary; but we may mention that the males of the first-mentioned may be distinguished from the females by their toes being more fully webbed, and also by the presence upon the inner fingers of swollen pads, which are covered during the breeding season with a number of spine-like growths.

The following extract taken from an essay on frogs, written by a Norwegian boy immigrant, may also prove instructive:

"What a wonderful bird the frog are. When he stand he sit, almost. When he hop he fly, almost. He ain't got no sense, hardly. He ain't got no tail, hardly, either; when he sit, he sit on what he ain't got, almost."

The Edible Frog is not indigenous to this country, but was introduced from the Continent many years ago by the monks.

In many parts of Europe its flesh is eaten. After being killed, the hind legs and part of the backbone are cut off, skinned, strung up by dozens on skewers, and sold in the markets at from tenpence to two shillings a dozen, according serving as an exit for the tadpoles when they hatch out.

An Indian Flying-frog also has the curious habit of depositing its eggs in a nest of froth, but this, instead of being situated in an underground chamber as in the case of the Japanese species, is attached to leaves overhanging the water, into which the young ones fall as soon as they are sufficiently developed to be able to swim.

White's Tree-frog is yet another example that lays its eggs in froth, the bubbly nest floating upon the surface of the water ; while some of the Piping-frogs scoop out a hole in the vicinity of water for the reception of their eggs, which are enveloped in froth so as to prevent them from drying up.

Under normal circumstances the tadpoles of the latter are washed out of their basin-like nest by the heavy rains that fall in the autumn, and are carried to the adjacent pools ; but in the event of there being a drought, the youngsters remain in their nursery until the following year.

A tree-frog of the genus *Phyllomedusa*, found in Southern Brazil, encloses its eggs between several willow leaves, the edges of which are fixed together by means of a sticky secretion, and a small opening being left at the lower extremity of the nest through which the newly-hatched young ones can emerge.

Central Europe is the home of the Midwife Toad, the males of which take care of the eggs laid by the females. The eggs are produced in the form of long strings, through which the father thrusts his hind-feet so that the eggs become entwined around his thighs. He then makes his way to a hole in the ground or some other suitable refuge wherein he can hide, only coming forth at night in search of food and to moisten the eggs.

The devoted parent carries about his precious burden for about a month, but just before the tadpoles are ready to hatch out he enters the water and remains there until his offspring wriggle out of the eggs and swim off to look after themselves.

Having completed his duties, he loses his voice and does not start to croak again until the spring of the following year.

The habits of the Seychelle Frog are very interesting, for the parents carry their tadpoles upon their backs ; but even more remarkable are those of the Pouched Tree-frogs (*Nototrema*) of Tropical America, for the females are provided with a large pouch, situated beneath the skin of their backs, wherein the eggs are placed by the males, which are believed to make use of their hind-legs for that purpose. With most members of the genus the young complete their metamorphosis within this shelter and emerge as fully-developed frogs, but in others the babies leave the pouch in the larval or tadpole stage.

In one of the Cingalese Tree-frogs the female carries her eggs attached to the under surface of her body within a shallow depression in her skin ; while a somewhat similar habit is displayed by the Surinam Toad, although, in this case, the female carries the eggs embedded in the skin of her back, which becomes very soft and of a spongy nature during the breeding season.

The exact manner in which the eggs reached their strange situation was first revealed by observations made of a pair of these toads that were exhibited at the London Zoo in the year 1896.

Mr. Bartlett, the Superintendent of the Gardens at that time, gave an interesting description of the proceeding, from which we take the following extract :

"The oviduct of the female," he writes, "protruded from her body more than an inch in length, and the bladder-like protrusion, being retroverted, passed under the belly of the male on to her own back. The male appeared to press lightly upon this protrusion and to squeeze it from side to side, apparently pressing the eggs forward, one by one, to the back of the female.

"By this movement the eggs were spread with almost uniform smoothness over the whole back of the female, to which they became firmly adherent."

After the eggs have been placed in position, the soft skin closes over them so that each one is encased in a separate cell.

The young ones undergo their entire transformation therein, and after a period of about eighty-two days emerge by breaking through the skin, as if they were lifting up the lid of a box.

As the female may carry as many as seventy eggs at a time, she presents a comical appearance when the babies are thrusting their heads and arms from the cavities in her back.

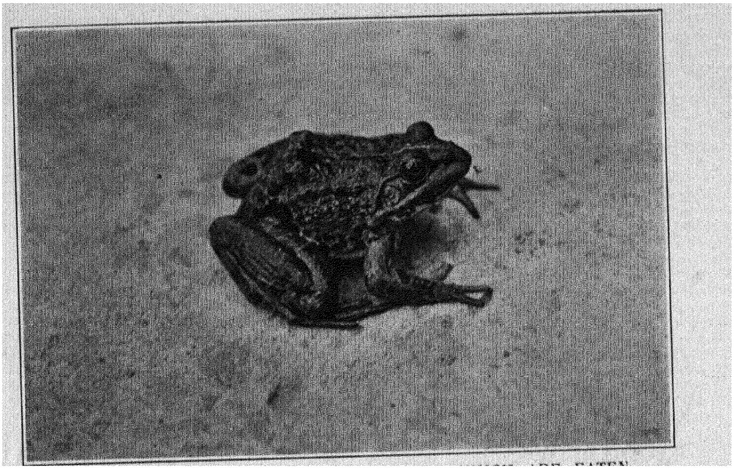
The female Goeldi's Tree-frog, from Brazil, also carries its eggs upon her back, these being placed in an oval depression surrounded by a narrow fold of skin ; while that of another species found in Brazil and Peru lays her eggs in shallow puddles and leaves the male to look after the welfare of the tadpoles. But as the water often dries up in hot weather, the watchful parent is sometimes kept very busy transporting his offspring to fresh quarters—the youngsters clinging to his back with the aid of their sucker-like lips during the proceeding.

In the West African Short-footed Frog, the female carries her eggs within her mouth; while the "Ferreiro" or "Smith," to which we have previously referred in regard to its peculiar cry, makes a circular nest in shallow water, surrounded by a wall of mud.

An interesting description of the building of one of these nests is given by Mr. Goeldi in the *Proceedings of the Zoological Society.*

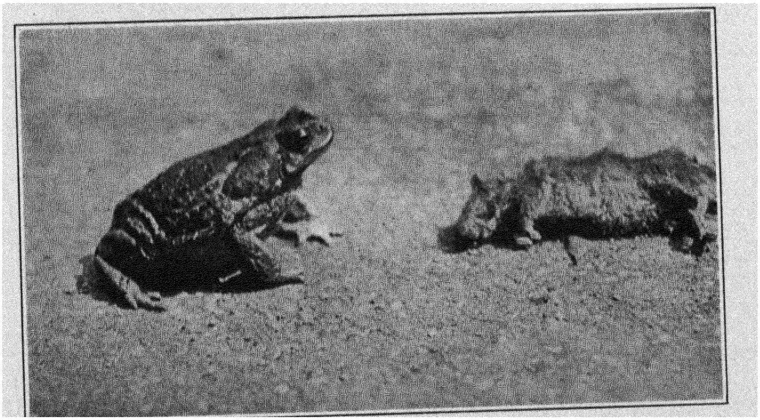
The author, whose statements are based upon personal observation, states:

"We soon saw a mass of mud rising to the surface carried by a tree-frog, of which no more than two hands emerged. Diving again, after a moment's time, the frog brought up a second mass of mud near the first. This was repeated many times, the result being the gradual erection of a circular wall. From time to time the builder's head and front part of body appeared suddenly with a load of mud on some opposite point. But what astonished us in the highest degree was the manner in which it used its hands for smoothing the inside of the mud wall, as would a mason with his trowel. When the height of the wall reached about four inches the frog was obliged to get out of the water. The

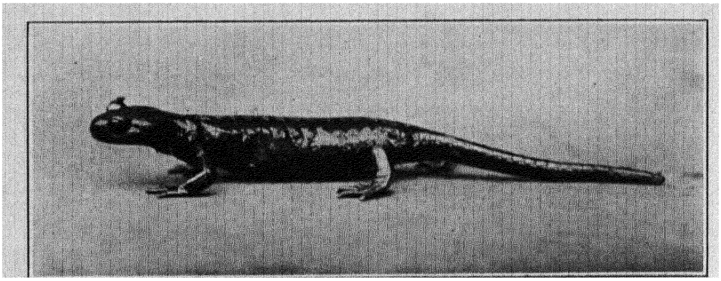


THE EDIBLE FROG, THE HIND LEGS OF WHICH ARE EATEN

(See page 229)

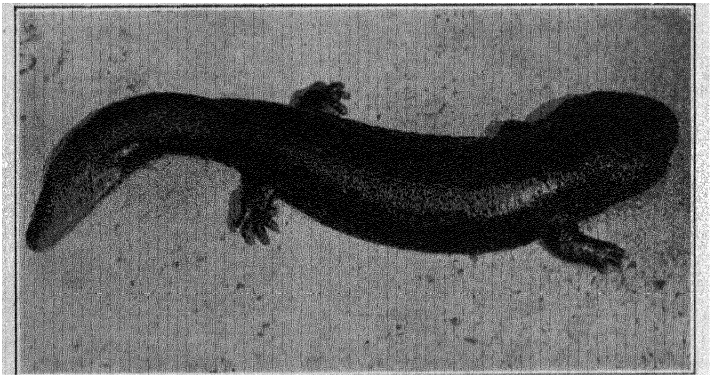


THE GIANT TOAD WITH ITS DINNER *(See page 230)*



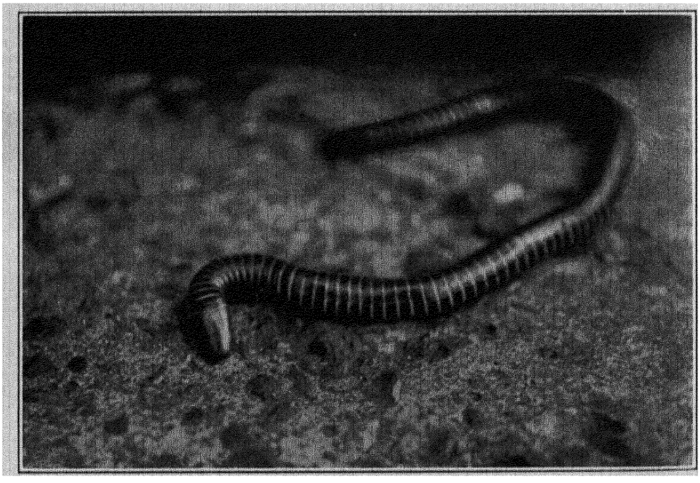
THE BLACK OR ALPINE SALAMANDER

(See page 239)



THE GIANT SALAMANDER, THE FLESH OF WHICH IS EATEN IN JAPAN

(See page 240)



THE AMERICAN CAECILIAN WHICH DWELLS UNDERGROUND

(See page 250)

parapet of the wall receives the same careful smoothing, but the outside is neglected. The levelling of the bottom is obtained by the action of the lower surface (belly and throat principally), together with that of the hands."

CHAPTER XIX

SALAMANDERS, NEWTS, AND THEIR KINDRED

THE present group of Amphibians differ from the frogs and toads inasmuch as they retain their tails throughout their lives. Some are aquatic in habits, and others are terrestrial ; but most of them pass through the early stages of their existence in the water.

Of the typical or true Salamanders, which are characterized by the absence of gills in the adults, and by the presence of well-developed eyelids, the most familiar example is the European Spotted Salamander, which is easily distinguished from all others by its conspicuous black and golden-yellow colouring.

Many remarkable powers have been credited to this creature, and according to ancient belief it was not only able to live uninjured in the midst of fire, but was even reputed to be produced by intense heat. Aristotle says it is reported that the Salamander puts out a fire by going through it, and Elian tells us it will live in flames and attack fire like an enemy. It is also of interest to note that owing to this erroneous belief the name of "Salamander's wool" has been applied to the incombustible material known as asbestos.

Measuring about eight inches in length, this salamander is found in damp situations, and, when adult, is terrestrial in habits.

But during the breeding season the female visits the water for the purpose of producing her young ones, which are born in a larval condition with external gills.

Another well-known species is the Alpine or Black Salamander, found in the Alps at elevations varying from three thousand to ten thousand feet. It is not so large as the Spotted Salamander, and is of a uniform black colour. As a rule the young undergo their transformation within the egg, so that they arrive into the world as fully-developed salamanders; but in the lower altitudes of the Alps the females sometimes produce their young in an advanced larval condition, while the members of a certain colony found in a small lake on the southern side of those mountains are remarkable inasmuch as they retain gills throughout life and never grow up.

The name of "fish-like" salamanders is given to a group that are entirely or mainly aquatic in habits at all stages of their lives, while they also differ from the typical forms by reason of the fact that their eyes are unprovided with eyelids.

Of the three different kinds that are known, the Giant Salamander of China and Japan, which grows to a length of more than five feet, claims the distinction of being the largest of all Amphibians. It is a hideous-looking creature, with a large, broad, and flat head, very short limbs, and small eyes.

The reptile was first brought to the notice of Zoologists in the year 1820; and in 1829 two living examples (the first of their kind) were imported into Europe. These were exhibited at the Amsterdam Aquarium, and although one came to an untimely end through being eaten by its companion, the survivor lived there for fifty-two years.

At the time of writing several of these Giant Salamanders are to be seen in the Aquarium at the London Zoo, but owing to their lethargic disposition and ungainly appearance they do not prove so attractive to visitors as many other exhibits at that wonderful institution.

The Giant Salamander, which is entirely aquatic in habits, frequents mountain streams at high elevations, and feeds upon worms, frogs, crustaceans, and fish. The Japanese eat its flesh, capturing the creature with a baited hook and line.

The second species is known as the Hellbender or Mississippi Salamander. Of very similar appearance to the foregoing, but only attaining a length of about seventeen inches, this animal is nocturnal in habits, and during the daytime seeks shelter between the crevices and cavities of submerged rocks.

In such situations the female lays her eggs in the form of a twisted string ; but when once her duties are completed, the male takes charge of the ova and drives his spouse away so as to prevent her from eating them—a habit to which she is much addicted.

The last of the present group is the Three-toed Salamander or Amphiuma, an ell-shaped creature that attains a length of three feet, and comes from South Eastern United States. Its limbs are extremely small, and its blackish-brown skin is so smooth and slimy that the creature can easily wriggle out of the hand of a person who picks it up. It dwells in the muddy rivers and swamps, and is very often found in the rice-field irrigation channels. Frequently it will burrow in the mud like a worm, and an instance is recorded of an individual being found at a depth of more than a yard below the surface.

The Gilled Salamanders, which receive their name from the fact that they retain external gills throughout their lives, are represented by the Olm or Proteus, and the Furrowed Salamander, Necturus, or Menobranch.

The habits of the former are very interesting, for the creature lives in total darkness amidst the subterranean waters of the caves in the mountains of Carinthia, Carnolia, and Dalmatia. It is quite blind, its minute eyes being hidden beneath its skin. Snake-like in form, and growing to a length of about ten inches, its skin is normally of a pale flesh-colour, and its gill-fringes of a coral-red tint. But if the animal be exposed to bright light for a long time, it gradually assumes a darker shade and eventually becomes quite black.

The limbs are very small, and whereas each of the front feet are provided with three toes, the hinder ones only have two. Young individuals, however, only possess two on both their fore and hind feet, but as they grow up a third one is developed on the former.

Owing to the inaccessible nature of their habitat, Olms can only be captured during times of floods, when the subterranean waters rise to high levels. They thrive well in captivity, and have been known to live in that state for as long as eight years. They can abstain from food for a very long period, and an individual that formerly dwelt at the London Zoological Gardens did not eat anything for more than two years, although it eventually broke its fast and commenced to feed regularly.

The Furrowed Salamander or Necturus, which is found in the Eastern United States and Canada, receives its name from the conspicuous fold of skin present upon its throat. Measuring about twelve inches in length, the creature is mainly aquatic in habits, but will occasionally leave the water for short periods.

During the winter months it burrows beneath the mud so as to protect itself against cold and frost.

One of the most remarkable of the Tailed Amphibians is the Axolotl, a name that is applied to the aquatic, gill-breathing, and larval form of the lung-breathing and land-dwelling salamander known as the Amblystoma. For many years, however, the association between the two was not established, although the French naturalist Cuvier thought it was probable that the former was the immature form of an unknown salamander or newt.

The first living examples ever imported into Europe were six specimens that arrived at the

Jardin des Plantes, in Paris, in the year 1864, of which only one happened to be a female. During the following year this individual laid some eggs, thereby upsetting for the time being the supposition put forward by Cuvier that the Axolotl was not a fully-developed animal, for hitherto no amphibian had been known to breed in an immature state. In due course some young ones emerged from the eggs, and when the babies had reached the age of two years, some of them commenced to lose their gills and the crest along the ridge of their tails and backs, until, finally, they left the water in the form of lung-breathing salamanders of a similar nature to those that had for long been known as Amblystomas. In 1876 these transformed Axolotls laid some eggs from which tadpoles hatched out, some of which remained in the larval stage throughout their lives, while others ultimately assumed the form of their parents.

This sequence of events revealed the remarkable fact that the Axolotl will breed in both its immature and mature condition, a state of affairs that may be likened unto a frog producing offspring when in either the tadpole or fully-developed stage.

Since then many successful experiments have been carried out to force Axolotls to transform to Amblystomas by gradually reducing the water in their tanks so as to compell them to breathe atmospheric air and develop lungs ; while feeding with thyoid gland is another method of treatment that has yielded similar results and induced them to give up their infantile habits.

It must not be assumed, however, by the above remarks, that all Axolotls are liable to remain permanently in a larval state, for those found in the United States always attain the adult condition, although others inhabiting the lakes surrounding the city of Mexico never undergo a metamorphosis. Why the latter should emulate Peter Pan and never grow up remains a mystery, but Dr. Gadow suggests as an explanation that the ideal conditions under which they live, and the abundant supply of food found in the lakes, are so highly satisfactory from the Axolotl's point of view that they are perfectly content to remain in their immature state rather than leave their home and commence a new existence upon land as transformed lung-breathing creatures.

The Axolotl (a Mexican word meaning " to play in the water ") thrives well in captivity, and breeds freely in that state.

In this country the female lays her eggs during the month of December, and sometimes again in April and May. On these occasions she may produce as many as seven hundred eggs, which she attaches either singly, or in small bunches not exceeding eight in number, to the leaves of aquatic plants. The larvæ, which hatch out after an interval of from ten to twenty days, according to the temperature of the water, grow very rapidly and commence parental duties on their own account when about a year old.

Axolotls are normally of a blackish-brown colour, but domestication has evolved a white form with pink eyes.

Although newts are somewhat similar in appearance to lizards, they may easily be distinguished therefrom by their soft, scaleless skin, and by the absence of claws upon their toes. They have a long, laterally-compressed tail which is employed for progression through the water, and in many species the males are provided during the breeding season with a specially-developed dorsal crest. The females attach their eggs to submerged leaves of aquatic plants, or to stones, depositing them singly or in small batches. The larvæ, which pass through a series of transformations before reaching the adult stage, are curious in the fact that their fore-legs appear earlier than their hind ones, thereby reversing the order of development in the tadpoles of frogs and toads.

Of the twenty different kinds of newts that are known, three species, namely the Common or Smooth Newt, the Crested Newt, and the Palmated Newt, are found in the British Isles. The former, which is the only one inhabiting Ireland, and is absent in Wales, measures between three and four inches in length. Its colour is light-brown above and yellow or orange, spotted with black, below. During the breeding season the male grows a high crest along the ridge of his back and tail, decorated with red, blue, and black tints.

The Crested Newt or Triton is the largest of the British species, and attains a length of about five and a half inches ; while the Palmated Newt is the smallest, and rarely exceeds three inches in length. The male of the latter is curious in the fact that during the breeding season its feet are provided with webs.

As all newts are of very similar appearance, and it would only be wearisome to the reader were we to describe their different colours, shapes, and markings, we will conclude our remarks thereon by mentioning the Alpine Newt and the Pleurodale Newt ; the former being singled out for special attention because the male in his nuptial dress is adorned with a pale-blue band along either side of his body, and a low crest decorated with black and yellow markings ; while the latter, which is found in Spain, Portugal and Morocco, is curious because it possesses very long ribs, which, in some individuals, actually perforate the skin so that the points form a row of small excresences on either side of the body.

CHAPTER XX

THE LIMBLESS AMPHIBIANS

THE Limbless Amphibians are only represented by the Apodas or Cæcilians, worm-like and burrowing creatures, in which the tail is either absent or of a rudimentary nature. Their eyes, when present, are very small and usually covered with skin ; while the body is encircled by numerous grooves, and in some species small bony plates are present under the skin. A short, cone-shaped, and retractile tentacle is situated between the eyes and the end of the snout, and this serves as a sensory organ to assist the creatures to feel their way about in the darkness of their underground homes.

Cæcilians, which are found in Tropical Africa and America, South-East Asia, and the Seychelles, feed upon earth-worms and various forms of insect life. Some kinds are oviparous and others viviparous.

In the common Cingalese species, which attains a length of about fifteen inches, the female makes a hole in the moist earth for the reception of her eggs. When these are laid she coils her body around them and remains on guard until the young ones are ready to hatch out.

The tadpoles, which are in a very advanced state when they escape from the thick and gelatinous envelope of the eggs, and have lost their external gills, immediately make their way into the water, where they spend the early part of their existence.

But the young of the Seychelles Cæcilian are even more precocious than those of the former, for not only do they emerge from the egg in the perfect form, but they at once commence to burrow underground, instead of going to the water.

The South American Cæcilians do not lay eggs, but produce their young in a fully-developed condition ; while the West African species is also viviparous, but the young ones are not born in such an advanced state.

Cæcilians are rarely imported into this country, but some time back an example of the American species arrived at the London Zoo. But owing to its burrowing habits it was never on view unless dug out of the ground for inspection.

INDEX

Adder, 101, 105-112
— Puff, 25, 44, 61, 117-118, 122-123
Adder, Bite of, 106-8
Adorned Terrapin, 145
Aesculapian Snake, 13
African Yellow-cobra, 121-2
Agama, Rough-tailed, 174
Agamoid Lizards, 172
Agile Frog, 226
Alligator, American, 162-4
— Chinese, 162, 164
— Mississippi, *see* American
Alligators, 162
Alligators and Crocodiles, 154-166
Alligator Terrapin, 146-7
Alpine Newt, 247
— Salamander, 239
Amblystoma, 243
American Alligator, 162-4
— Caecilian, 250
— Trionyx, 149
— Wood-storks, 120
Amphibians, Limbless, 249-250
Amphisbaenas, 192-3
Amphisbaena, Sooty, 193
— Two-handed, 194
Amphiuma, 241
Anaconda, 65, 71, 81-2
Annulated Snake, 95
Anti-venom Serum, 48
Apodas, 249
Aquatic Snakes, 81-91
Armadilloes, 115
Axolotl, 243-6

Ball Snake, 69
Banded Krait, 63-4
— Monitor, 196
Bark Gecko, 207
Barking Frogs, 225
Basilisks, 177-9
Beaded Lizard, *see* Heloderm
Bird, Crocodile, 158
Bite of Adder, 106-8
— Cobra, 41
— Rattlesnake, 41
Black Cayman, 165
— Kribo, 121
— Racer, 94
— Salamander, 239
Blind Snakes, 76
Blind-worm, 188
Blood-stained Mud-terrapin, 144
Bloodsucker, 174
Blue Krait, 63-4
Blue-tongued Lizard, 212
Boa, Constrictor, 29, 71-4
— Water, 65, 71, 81-2
Boomslang, 96-7
Bornean Flying-frog, 227-8
Box-tortoise, Carolina, 134
Box-tortoises, 133
British Snakes, 101-113
Broad-snouted Cayman, 165
Bronze Lizard, 212
Bull Frog, 225, 230
— Snake, 24
Burrowing Snake, West African, 76-7
Burrowing Snakes, 75-80
Bushmaster, 59-60

Caecilian, American 250
Caecilians, 249
Calabar Snake, 76
Calico Snake, 88
Cambridge Nightingales, 225
Cape Chameleon, 218-9
— Monitor, 197
Carolina Box-tortoise, 134
Carpet Python, 70
— Viper, 25
Casting old skin, Snakes' method of, 19-20
Cayman, 154, 165
Cayman, Black 165
— Broad-snouted, 165
— Spectacled, 165
Cerastes Viper, 17, 25, 63, 124
Ceratophrys, 225
Chameleon, Cape, 218-9
— Dwarf, *see* Cape

Chameleons, 214-220
Changeable Lizard, 174
Charmers, Snake, 45, 47
Chicken Snake, 95-6
Chinese Alligator, 162-164
Cinixys, 134
Cobra, Bite of, 41
Cobra, African Yellow, 121-2
— de Capello, 52-3
— King, 27, 53-4, 121
Cobras, 27, 29, 51, 55, 121
Common Frog, 222-3, 225
— Lizard, 171
— Newt, 247
— Scale-foot Lizard, 192
— Skink, 210
— Snapping-terrapin, 146-7
— Teguexin, 199
— Toad, 222, 229
— Viper, 101, 105-112
Comodo Monitor, 196
Constrictor, Boa, 29, 71-4
Constricting Snakes, 65-74
Copper-head, 83, 121
Coral Cylinder Snake, 78
Coral Snake, *see* Harlequin Snake
Crested Newt, 247
Crocodile Bird, 158
Crocodile, Estuarine, 159-160
— Marine, 159, 160
— Marsh, 160
— Nile, 156-9
— Salt-water, 159-160
Crocodiles and Alligators, 154-166
Cyclodus, Great, 212
Cylinder-Snake, Coral, 78
Cylinder Snakes, 77-8

Darwin's Frog, 228
Desert Monitor, 197
Devil, Thorny, 175
Diamond-back Terrapin, 143
Diamond Python, 70
Dragons, Flying, *see* Flying Lizards
Dutch Nightingales, 225
Dwarf Chameleon, *see* Cape Chameleon
— Toad, 226

Edible Frog, 225, 229
Egg-eating Snake, 98-100
Egyptian Skink, 210
Elegant Tortoise, 136
Elephantine Tortoise, 140
Elephant-trunk Snake, 83
Enemies of Snakes, 114-124
Eryx, Indian, 79
Eryx Snakes, 78-9
Estuarine Crocodile, 159-160
European Pond-terrapin, 142
Eye-poking Snake, 92

Fan-footed Gecko, 204
Farm, Snake, 50
Fat-tailed Gecko, 205
Fer-de-lance, 61
Ferreiro, 226, 236
Fire-bellied Toad, 228
Flying Dragons, *see* Flying Lizards
— Frogs, 227, 231
— Geckos, 206-7
— Lizards, 172-3
— Snake, 17, 18, 95
Flying-frog, Bornean, 227-8
Flying-lizard, Malay, 173
Frilled Lizard, 173
Fringed Gecko, 207
Frog, Agile, 226
— Bull, 225, 230
— Common, 222-3, 225
— Darwin's, 228
— Edible, 225, 229
— Giant, 230
— Grasshopper, 226
— Hairy-sided, 222
— Seychelle, 233
— Short-footed, 236
Frogs, Barking, 225
— Flying, 227, 231
— Piping, 226
— Tree, 225, 232
Frogs and Toads, 221-237
Frogs and Toads, Nesting Habits of, 231
— Teeth of, 224
— Vocal Sacs of, 224
Furrowed Salamander, 242

Gaboon Viper, 62
Galapagos Sea-lizards, *see* Marine Iguana
Ganges Trionyx, 147-9
Gavial, 154, 161-2
Gecko, Bark, 207
— Fan-footed, 205
— Fat-tailed, 208
— Flying, 206-7
— Fringed, 207
— Lobe-footed, 205
— Naked-toed, 208

Gecko, Verticillated, 207
Geckos, 170, 205-9
Giant Frog, 230
— Lizards, 195-204
— Salamander, 240
— Skink, 212
— Toad, 230
— Tortoises, 137-140
Gila Monster, 180
Glass-snake, 124, 190-1
Goeldi's Tree-frog, 235
Golden Tree-frog, 225
Gopher Tortoises, 134-5
Grass Snake, 102-4
Grasshopper Frog, 226
Great Cyclodus, 212
Grecian Tortoise, 130, 132
Green Mamba, 96-8
— Toad, 222
— Turtle, 150-1, 153
— Whip-snake, 92-3
Grey Monitor, 197-8
Ground Hornbills, 120

Hairy-sided Frog, 222
Hamadryad, 27, 53-4, 121
Harlequin Snake, 27, 51, 121
Hawksbill Turtle, 151-3
Hedge Lizard, 171-2
Hellbender, 241
Heloderm, 179-181
Hinge-back Tortoise, 134
Hoary Snake, *see* Mole Snake
Hog-nosed Snakes, 79
Hoop Snake, 14
Hornbills, Ground, 120
Horned Lizards, 176-7
— Viper, 17, 25, 63, 124
How Snakes move, 16-17

Iberian Tortoise, 130-1
Iguana, Marine, 201-3
— Tuberculated, 199-201
Iguanas, 199-201
Indian Eryx, 79
— Python, 21, 68

Jacares, *see* Cayman
Jackass, Laughing, 119
Jaracara, 61

King Cobra, 27, 53-4, 121
— Snake, 27-8, 121

Kingfisher, Laughing, 119
Krait, Banded, 63-4
— Blue, 63-4
Kraits, 63-4
Kraken, 86-91
Kribo, Black, 121

Lace Monitor, 198
Land Tortoises, 125-141
Laughing Jackass *or* Kingfisher, 119
Leathery Turtle, 126, 153
Legless Lizards, 188-194
Limbless Amphibians, 249-250
Lizard, Beaded, *see* Heloderm
— Blue-tongued, 212
— Bronze, 212
— Changeable, 174
— Common, 171
— Frilled, 173
— Hedge, 171
— Moloch, 175
— Sand, 171-2
— Sea, 201
— Sleeping, 211
— Stump-tailed, 124, 211
— Tuatera, 182-7
— Viviparous, 171
Lizards, Agamoid, 172
— A talk about, 167-181
— Flying, 172-3
— Galapagos, 201, 203
— Giant, 195-204
— Horned, 176-7
— Legless, 188-194
— Poisonous, 179
— Scale-foot, 192
Lobe-footed Gecko, 205
Loggerhead Turtle, 153
Long-necked Terrapin, 145-6
Long-nosed Viper, 62
Luth, *see* Leathery Turtle

Malay Flying-lizard, 173
Margined Tortoise, 131, 133
Marine Crocodile, 159, 160
Marine Iguana, 201-3
Marsh Crocodile, 160
Matamata Terrapin, 145
Menobranch, 242
Midwife Toad, 233
Mississippi Alligator, 162-4
— Salamander, 241
Moccasins, 121
Mole Snake, 33

Moloch Lizard, 175
Mongooses, 115-7
Monitor, Banded, 196
— Cape, 197
— Comodo, 196
— Desert, 197
— Grey, 197-8
— Lace, 198
— Nile, 197
— Water, 196
— White-throated, 197
Monitors, 195-8
Monster, Gila, 180
Mud-terrapin, Blood-stained, 144
Mud Terrapins, 144
Mugger, 160
Musk Terrapin, 144

Naked-toed Gecko, 208
Natterjack Toad, 229
Necturus, 242
Nesting Habits of Frogs and Toads, 231
Newt, Alpine, 247
— Common, 247
— Crested, 247
— Palmated, 247
— Pleurodale, 247
— Smooth, 247
Newts, 246-8
Newts and Salamanders, 238-248
Nightingales, Cambridge, 225
— Dutch, 225
Nile Crocodile, 156-9
— Monitor, 197
— Trionyx, 148-9
North American King-snake, 121
Nose-horned Viper, 62

Olm, 242-3
Ocellated Sand-skink, 210

Painted Terrapin, 145
Palmated Newt, 247
Pineapple Snake, 60
Piping Frogs, 226
Pleurodale Newt, 247
Poisonous Lizards, 179
— Snakes, 35-64
Pond-terrapin, European, 142
Pouched Tree-frog, 233
Proteus, 242-3
Puff-Adder, 25, 44, 61, 117-8, 122-3
Python, Carpet, 70
Python, Diamond, 70
— Indian, 21, 68
— Reticulated, 65
— Rock, 69
— Royal, 69

Racer, Black, 94
Racers, 29, 94
Radiated Tortoise, 136
Rat-snake, 20, 24
Rat-tailed Serpent, 61
Rattlesnake, Bite of, 41
Rattlesnakes, 25, 55, 59
Red Snake, 77-8
— Teguexin, 199
Reticulated Python, 65
Rhinoceros Viper, 62
Ringed Snake, 101-2
Ringhals Snake, 55
Rock Python, 69
Rough-tailed Agama, 174
Royal Python, 69

Salamanders and Newts, 238-248
Salamander's Wool, 239
Salamander, Alpine, 239
— Black, 239
— Furrowed, 242
— Giant, 240
— Mississippi, 241
— Spotted, 239
— Three-toed, 241
Salt-water Crocodile, 159-160
Sand-fish, 210
Sand-skink, Ocellated, 210
Sand Lizard, 171-2
— Snakes, 78-9
Scale-foot Lizards, 192
Scale-foot, Common, 192
Scheltuposik *see* Glass-snake
Sea Lizard, 201
— Serpent, 86-91
— Snakes, 83-6
Secretary Bird, 118-120
Seps, 212
Serpent, Rat-tailed, 61
— Sea, 86-91
Serum, Anti-venom, 48
Seychelle Frog, 233
Shield-tails, 77
Short-footed Frog, 236
Skink, Common, 210
— Egyptian, 210
— Giant, 212
— Sand, 210

Skink, Three-toed, 212-3
Sleeping Lizard, 211
Slow-worm, 101, 171-2, 188-190
Smooth Newt, 247
— Snake, 101, 112-3
Snake, Aesculapian, 13
— Annulated, 95
— Ball, 69
— Bull, 24
— Calabar, 76
— Calico, 88
— Chicken, 95-6
— Coral, *see* Harlequin
— Egg-eating, 98-100
— Elephant-trunk, 83
— Eye-poking, 92
— Flying, 17-8, 95
— Grass, 101-4
— Harlequin, 27, 51, 121
— Hoary, *see* Mole
— Hog-nosed, 79
— Hoop, 14
— King, 27-8, 121
— Mole, 33
— Pineapple, 60
— Rat, 20, 24
— Red, 77-8
— Ringed, 101-2
— Ringhals, 55
— Smooth, 101, 112-3
— Summer, 95
— Wart, 83
— Whip, 29, 92, 94
Snake Charmers, 45, 47
— Farm, 50
— Stone, 48
Snake-necked Terrapins, 145
Snakes, A talk about, 11-34
— Aquatic, 81-91
— Blind, 76
— British, 101-113
— Burrowing, 75-80
— Constricting, 65-74
— Cylinder, 77
— Enemies of, 114-124
— Eryx, 78-9
— Poisonous, 35-64
— Sand, 78-9
— Sea, 83-6
— Spitting, 54-5
— Tree, 92-100
— Veneration and Worship of, 58, 70,
— Venom of, 39, 53
Snapping Turtles, 146
Soft-shelled Terrapins, 147
— Tortoise, 135
Sooty Amphisbaena, 193
Spanish Terrapin, 144
Spectacled Cayman, 165
Spitting Snakes, 54-5
Spotted Salamander, 239
Spread-head, 80
Starred Tortoise, 136
Stink-pot Terrapin, 144
Stone, Snake, 48
Stump-tailed Lizard, 124, 211
Summer Snake, 95
Surinam Toad, 234
Surucucu, 60

Teeth of Frogs and Toads, 224
Teguexins, 198
Teguexin, Common, 199
— Red, 199
Tejus, *see* Teguexins
Terrapin, Adorned, 145
— Alligator, 146-7
— Blood-stained Mud, 144
— Common Snapping, 146-7
— Diamond-back, 143
— Long-necked, 145-6
— Matamata, 145
— Mud, 144
— Musk, 144
— Painted, 145
— Snake-necked, 145
— Soft-shelled, 147
— Spanish, 144
— Stink-pot, 144
Terrapins and Turtles, 142-153
Thorny Devil, 175
Three-toed Salamander, 241
— Skink, 212-3
Toad, Common, 222, 229
— Dwarf, 226
— Fire-bellied, 228
— Giant, 230
— Green, 222
— Midwife, 233
— Natterjack, 229
— Surinam, 234
— Yellow-bellied, 228
Toads and Frogs, 221-237
Tokay, 207
Tongue of Snakes, 21-3
Tortoise-shell, 151
Tortoise, Elegant, 136
— Elephantine, 140
— Grecian, 130, 132
— Hinge-back, 134
— Iberian, 130-1
— Margined, 131, 133
— Radiated, 136

Tortoise, Soft-shelled, 135
— Starred, 136
— Water, 142
Tortoises, Box, 133
— Giant, 137-140
— Gopher, 134-5
— Land, 125-141
Tree-frog, Goeldi's, 235
— Golden, 225
— Pouched, 233
Tree Frogs, 225, 232
— Snakes, 92-100
Trionyx, 147-9
Trionyx, American, 149
— Ganges, 147
— Nile, 148-9
Triton, 247
Tuatera Lizard, 182-7
Tuberculated Iguana, 199-201
Turtle, Green, 150-1, 153
— Hawksbill, 151-3
— Leathery, 126, 153
— Loggerhead, 153
Turtles, Snapping, 146
Turtles and Terrapins, 142-153
Two-handed Amphisbaenas, 194

Use of Snakes, The, 11-12

Veneration and Worship of Snakes, 58, 70
Venom of Snakes, 39, 53
Verticillated Gecko, 207
Viper, Carpet, 25
— Cerastes, *or* Horned, 17, 25, 63, 124
— Common *or* Adder, 101, 105-112
— Gaboon, 62
— Long-nosed, 62
— Rhinoceros *or* Nose-horned, 62
Vipers swallowing young, 109-112
Viviparous Lizard, 171
Vocal Sacs of Frogs and Toads, 224

Wart Snakes, 83
Water Boa, 65, 71, 81-2
— Monitor, 196
— Tortoise, 142
West African Burrowing Snake, 76-7
Whip Snake, 29, 92, 94
Whip Snake, Green, 92-3
White-throated Monitor, 197
Wood-storks, American, 120
Wool, Salamander's, 239

Yellow-bellied Toad, 228
Yellow Cobra, African, 121-2

BRISTOL: BURLEIGH LTD., AT THE BURLEIGH PRESS.